ROGERS PASS ENVIRONMENTAL
ASSESSMENT PANEL

PUBLIC MEETINGS

CP RAIL ROGERS PASS DEVELOPMENT PROJECT

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ROGERS PASS ENVIRONMENTAL ASSESSMENT PANEL

In the matter of Public Meetings of the Environmental Assessment Panel on CP Rail's proposed new track development in Rogers Pass.

PANEL MEMBERS:

P.J. Paradine -- Chairman

Dr. W. Ross

Mr. G. Tench

Held in the Sandman Inn, Petroleum Room, Calgary, Alberta, on Saturday, the 11th day of June, 1983, at the hour of 2:00 p.m., Local Time.

VOLUME IV

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THE CHAIRMAN: (Mr. Phil Paradine):

Good morning Ladies and Gentlemen. This morning's session is on revegetation reclamation and tunnel ventilation issues. Visual impact assessment is also going to be covered under revegetation reclamation.

We are going to start this morning with a presentation by Mr. Fox's consultants on revegetation reclamation followed by the Panel's technical expert and then Parks Canada; continue our discussion afterwards. After those people have made their presentation and when we are finished with that issue, we will then switch over to the tunnel ventilation acoustical issue, and we have speakers from C. P. Rail, a consultant, and we also have a Panel technical expert on that particular issue as well.

Before we start I would like to make one request to C. P. on the record -- not to C. P. but to Parks Canada on the record, and that is whether they could inform us whether they ever had a camp site, workers camp site of the size that is being proposed for this particular project or what is the largest work camp that they have had within their parks, within the system. I realize that may take a bit of searching for, but perhaps somebody could send us a letter or perhaps you can delegate it upwards to Ottawa to find out

(MacGregor)

the answer to that particular one.

Therefore, we will move now right away to I believe Mr. McGregor and then Mr. Polster.

MR. JAMES McGregor, (MacLaren Plansearch): Good morning Mr. Chairman, Members of the Panel, Ladies and Gentlemen. I will just preface my remarks by stating that the first ten minutes of the presentation will deal with the methodology that we used, and that will be followed by about a 20-minute discussion on the actual visual results, and that will be followed by a presentation by Bruce Haggerstone on the vent shaft.

In the introduction to our report we noted that following a request from Parks Canada and the Environmental Assessment Review Panel, C. P. Rail retained the services of MacLaren Plansearch to prepare a visual impact assessment for the twinning of the C. P. Rail through the Beaver Valley. The results of this inquiry has been the preparation of one of the most comprehensive visual impact assessments ever taken in Canada.

The conclusions of that effort are presented to you on the exhibit panels and in this comprehensive Green document and during this visual presentation. Should you have any questions

(MacGregor)

about the content of these graphic exhibits, please do not hesitate to contact my colleagues, Bruce Haggerstone, John Foster or myself.

In our studies the visual implication of the second track are considered from the point of view of the travellers along the Trans Canada highway where their scenic views would be affected by the cuts and fills resulting from track construction.

The study responded to the key issues discussed in the FEARO Report Number 20:

> "The most serious concern raised related to the potential for terrain impact along the surface route, and the difficulty in achieving satisfactory reclamation".

In addressing this issue the visual impact assessment study developed a comprehensive understanding of the existing visual resources, assessed the landscape's capability of absorbing the second track, provided design guidelines necessary to minimize cuts and fills and outlined mitigative measures and the monitoring program necessary to adapt the new track to the existing landscape conditions. We also considered the visual impact of the ventilation shaft. As I mentioned, Mr. Haggerstone will discuss that later.

(MacGregor)

The basic purpose then of the study is two-fold:

First, to protect as much as is reasonably possible the integrity of existing Park landscape, while at the same time permitting the Beaver Valley to fulfill its role as a transportation corridor of national importance.

The valley was studied in terms of the perceptions of both the eastbound and the westbound travellers. For the most part they are across the valley from the proposed track where they experience two distinct viewing situations. First is from the top of Heather Hill where views are directed south over the length of the valley floor and the second set of viewing situations are from the valley floor itself.

It is important to note that historically the Canadian Pacific Railroad has been part of the visual and cultural heritage of Glacier National Park for the past century. In 1882, Major Rogers, an employee of C. P. Rail, discovered Rogers Pass. Three years later the railway over Rogers Pass was opened thus completing an east-west link that encouraged British Columbia to eventually join Confederation. Much of that line is still in use today and exists as a faint line along the west slope of the Hermit Range.

(MacGregor)

The Rogers Pass area was not only developed as a transportation corridor but also as a tourism destination region. In 1895 the Canadian Pacific Railway built the Glacier House Hotel, attracting climbers and hikers from around the world.

We believe it is fair to say then that there is a strong historic precedent for C. P. Rail's involvement in the Rogers Pass area. In fact, it may be assumed that the very existence of Glacier National Park is, in part, linked to the activities of C. P. Rail. The construction of a second main line therefore represents the continuation of a transportation heritage that has characterized this region for the last century.

Before explaining our approach and its results, let me first outline just the primary objectives of the study. They were to firstly work directly with the design staff of C. P. Rail to minimize the adverse visual impacts of the construction and operation of its second line, and to provide FEARO and Parks Canada with the necessary information to assess the visual impacts of the proposed mitigative measures.

The approach was based on a comprehensive inventory and analysis of the visual features in the landscape; appreciation of the visitor's experience as they travelled along the Trans Canada highway; an understanding of the

(MacGregor)

inherent capability of the landscape to visually absorb the facility ; an ability to work interactively with advance computer-aided designing technology. The exhaustive inventory analysis of all natural and man-made features was the basis of the assessment process. Combined with an all inclusive tabulation of various experiences and perceptions of the visitor, it enabled the consultants to have a sensitive understanding of the potential effects of the proposed railway.

This appreciation was first applied to identify specific key observation points. Evaluation of these"KOPS",as we call them, indicate the overall capability of the landscape in the Beaver Valley view shed to absorb or camouflage the proposed line. The in-depth inventory and analysis of landscaping components and the visitor's experience was imperative to the consultant's ability to interact with the computer during the alignment stage. As well, the use of computer s meant that many center line refinements could be made in a relatively short period of time, rather than a static approach to alignment design and evaluation. We also participated with C. P. Rail engineers in active process with the computer. This ensured that the final alignment was truly a cooperative effort, combining visual mitigative measures and high quality engineering design.

(MacGregor)

Parks Canada representatives also provided important and constructive input during the design process. Their observations on the fourth alignment was incorporated into the fifth design alignment and contributed significantly to its final quality.

In summary then, the design of the new track was carried out in a spirit of cooperation and respect for the visual environmental reclamation and engineering requirements. The interaction of the various disciplines from C. P. Rail, Parks Canada and the consultants assured that the proposed design would have the least possible visual impact.

The visual impact assessment consisted of four phases outlined in this slide. The first two established a comprehensive appreciation of the visual environment and the visitor's perception of the Beaver Valley. The last two phases applied that understanding to generate design proposals with the C. P. Rail engineering staff.

The four phases are noted as follows:

Phase 1: the visual resource inventory and analysis;

Phase 2: the synthesis evaluation and determination of the visual absorption capability.

(MacGregor)

Phase 3: included the evaluation of the various alternative designs,

Phase 4: resulted in the proposed design itself.

Time limitations do not permit us to go into a detailed description of all the features that we have inventoried and analysed but the following slides will give you an indication of our comprehensive inquiry.

We firstly defined the Valley in its regional context from the point of view of the eastbound and westbound traffic in terms of its visual landscape units and finally we divided the Valley into its landscape components. Firstly, we looked at the landscape elements. All of those static elements, or all of those static objects rather, or voids in the landscape. We then looked at the landscape dynamics for those features that are always changing with respect to the movement of the park visitor travelling through the Park in their car, and finally we looked at landscape perception, which results from the visitor's behavioural environment, be it cultural, historical or social.

While landscape elements and dynamics are fairly easy to understand, I think perhaps a brief explanation of the different ways a Park visitor may perceive this new track is important.

(MacGregor)

The Park is a unique and scenic and physical environment and locating a railway in this environment may be considered as an intrusion into this semi-wilderness area. However, knowing that the Valley was first opened by the railway and subsequently became a National Park alters some people's perception of the relationship between the railway and the landscape. Therefore, the Beaver Valley will be perceived by many visitors as an important and necessary rail transportation link between central Canada's resources and its west coast markets and distribution points.

From this point of view the Beaver River Valley becomes a site of national importance to the Canadian economy and contributes to the standard of living of each Canadian. As we can see there can be a complete spectrum of attitudes to this second new proposed line.

Following this inventory 11 key observation points were located. These visually sensitive areas included five westbound views, for instance from Heather Hill; three eastbound views, such as from Connaught Hill; three important viewpoints, including the Park entrance lookout, the Beaver Marsh and Stoney Creek.

A visual absorption matrix criteria was then established. Based on our understanding of the visual environment, we were able to identify those criteria and thus have been able to assess

(MacGregor)

just how vulnerable the landscape was to modification. This slide outlines these criteria.

We then applied these criteria to each of the key observation points -- again those very sensitive areas, to determine which ones were the most important.

The synthesis and evaluation assessed the importance of each of the 31 individual landscape components as well as the impact of a proposed line on them. Emphasis was placed on determining the ability of each feature to detract from or augment the visual vulnerability of the new line. Finally an overall assessment of the visual absorption capability of each key observation point in the Beaver Valley view shed was made. This enabled the consultants to flag those areas and views that were the most sensitive.

It also became obvious that each landscape component individually contributes to the integration of the railway into the environment, and together they work in harmony to minimize the visual vulnerability of the landscape. The synthesis suggested that the Beaver Valley is a complex and diverse natural system and that this complexity directly and positively affects its ability to absorb or fit the railway into the environment.

In particular, the results of the visual absorption capability matrix clearly

(MacGregor)

indicate that the Beaver Valley has a high to moderately high capability of absorbing the track.

I will not go into the details of this procedure or discuss the research that is behind it at this point, but I do suggest that you take a look at the exhibit panels where the matrix is presented.

Before beginning design of the surface route it was firstly necessary for C. P. Rail engineers, the reclamation specialists and the landscape architects to establish design criteria. The following slide outlines these various criteria.

Five different alignments for the surface routes were proposed and evaluated, each being a refinement of the preceding design. Although the overall alignment was similar in all cases, many significant adjustments were made to solve engineering and visual impact problems. The design process will be summarized in the next five steps.

Firstly, with alignment number one, we flagged the areas of significant disturbance for serious concern and recommendations were made to minimize their impact. On the second alignment we took the recommendations into consideration and generated new cross-sections as well as computer graphic simulations of the priority areas. On alignment number three, we improved upon number two

(MacGregor)

and added retaining walls and bridge structures. Prospectives were generated from each key observation point and overlaid on the black and white photographs which you find in the Green Book. Alignment number four involved the participation of Parks Canada in a four-day work-shop. Park staff identified several concerns and the alignment was adjusted and improved when possible.

Finally the comments from the fourth alignment were incorporated to a fifth alignment, which became the proposed design. Prospective views of the proposed alignment were generated using C. P. Rail's data processing and plotting capabilities. These drawings were then applied to photographs taken from the various key observations points. In fact, these are the same drawings that we use on the display panels and which I will now use to describe the proposed design.

As I have frequently mentioned this proposed alignment is as a result of the interactive design and evaluation process. Various engineering, environmental reclamation and visual concerns were balanced against each other to yield the best possible solution.

The engineering requirements for the nine-mile surface route included a maximum

(MacGregor)

grade of one per cent, a maximum curvature of six degrees, a balance of cut and fills along the route and provision of adequate clearance of stream crossings. Other engineering constraints were created by steep slopes and unstable soils.

Visual concerns centered around the reduction of the size of cuts and fills in areas visible from the highway, while reclamation stressed the establishment of an erosion controlling cover and the reintegration of the disturbed sites into the natural successional processes. In some cases significant adverse visual impacts resulted in major changes to the proposed design. In many areas only a small adjustment was necessary while in a few locations engineering or visual constraints were so severe that only minor changes could be made.

I would now like to walk you down the surface route and through the use of these slides give you a description of what the final design will look like to the traveller on the Trans Canada highway. For graphic purposes, you will note that the disturbed areas are shown in dark brown -- of course, you will see that better if you approach the panel. However, in reality after Mr. Polster is finished with the reclamation treatment, it will be a colour and a texture that is more compatible with the natural environment.

(MacGregor)

I will treat this description by various sections frequently referring to the chainages that are marked on the slides. To begin with, we have the section from Rogers Siding to the Park boundary. This is just outside the limits of the photograph. From chainage zero to approximately 70, the line will be built on relatively flat terrain and will not be seen from any of the key observation points, because it is well screened behind coniferous trees.

From chainage 70 to the Park boundary, which is this line right here, we find that the Beaver River is near the base of the Hermit Range and up against the mountain side. The existing main line has been carved into the steep and rockyterrain just above the river. These physical constraints mean that the proposed line must therefore be squeezed between the Beaver River and the existing mainline necessitating rock cuts and the relocation of the existing line.

The cuts will be relatively large but there seems to be no alternative since the only other solution would be to relocate sections of the Beaver River and the placement of several large fills into the channel, into the river channel, which you can see just below. This would, of course have a much greater visual and environmental impact.

Although we recognize that

(MacGregor)

this section will be very visible from the two viewpoints on the Heather Hill, that is the viewpoint within the park and just outside the park, there is little that can be reasonably done to reduce the visual impact. However, the application of an asphalt emulsion plus the reclamation of the grade will greatly contribute to camouflaging the rocks and the cuts and consequently minimizing the visual impacts.

Looking at the park boundary to Mountain Creek, in this section the flanks of the Hermit Range are cut by the Mountain Creek Valley, which you can see cutting through here. The proposed alignment will run along the base of the mountain slope and then across the Mountain Creek fan, and you can basically see the Mountain Creek fan coming out here. Although this area is very visible from the Heather Hill viewpoint, potential adverse visual impacts will be reduced since the proposed alignment has been designed primarily on fills, thus reducing the number of more visible cuts. As a result most of the line will be hidden by the existing tall conifers. Nevertheless, some of the cut slopes will be visible as a subtle line that marks the clearing in the trees, much like the existing line.

For Mountain Creek to the Mountain Creek Terrace, which is this dark spot right here, the design was constrained by first of all two

(MacGregor)

requirements, which Mr. Fox mentioned yesterday. Firstly there was the need to keep the line as far away from the Mountain Creek campground as possible secondly to minimize the size of the fills in the gullies in the sections between chainage 163 and 176 -- it is just beyond. It is unfortunately hidden by this tree here, by moving the alignment up slope in the terrace area.

The alignment through Mountain Creek Terrace was considered acceptable because there is an already existing cut-over area, which you can see on this before construction photograph. Dave Polster will provide details of the proposed reclamation program for this area following our presentation. However, we would like to make a few observations.

The initial visual impact of this section will be significant since it is directly visible from the Heather viewpoint. So you can see it right in line with the views from that viewpoint as well as from the Trans Canada highway, which is just behind where the photograph was taken. However, the long term effect will be much less than the existing cuts through Mountain Creek, referring to these up here. The slopes will be flatter than the existing cuts and consequently make them easier to rehabilitate. As well the area will be given a high quality reclamation treatment, including a top dressing

(MacGregor)

of suitable soil and the use of more mature plant materials, probably in the range of six to seven feet high, in addition to the regular planting of trees and shrubs. Within a few years the terrace will appear as a densely planted and textured landscape similar to the vegetation in the avalanche paths. In the long term it will, of course, be totally integrated into the environment.

To screen the camp ground from visual contact and the effects of noise, a large berm will be constructed in this area. This will be an attractive land form and designed in an organic way to fit into the natural environment. Further down the line, C. P. Rail will build retaining walls to keep the size of the cut slopes to a minimum.

For Mountain Creek Terrace to Griffith Slide, the proposed line will cross the moderately steep side slopes and relatively shallow soils. However, visibility from these cuts is very low. This section is less visible for two reasons. Directly across the Valley, and you can see the Trans Canada highway in red, directly across the Valley tall conifers flank the highway along here, and, of course, this is solid vegetation between here and here, and the Heather Hill viewpoint is more than a mile away. So views from there are both distant and oblique.

(MacGregor)

In the Griffith and unnamed slide areas, the engineering requirements dictate that fills rather than cuts be used in this area to ensure a stable track bed as was mentioned yesterday. This approach also satisfies the visual design criteria since fills are easier to hide behind the vegetation than cuts. Nevertheless, this section is less visible than most because tall conifers are located adjacent to the highway and Heather Hill is almost two miles away, the Heather Hill viewpoint. All views, therefore, to the disturbed area will be both distant and oblique or almost hidden.

Between the unnamed slide and Raspberry Creek, bedrock is generally very close to the surface. The design calls for relatively small cuts in the rocks since the steep slopes would result in large fills and the loss of considerable vegetation. The exposed rock will be treated with an asphalt emulsion to darken its colour and small retaining bin walls will be used to prevent any unnecessary vegetation removal at the top of the slope. In any case, most of this section is not visible since tall conifers along the highway block most of the view. The Heather Hill viewpoint is more than three miles away and most of the views from there are screened by 80-foot high trees adjacent to the surface route.

(MacGregor)

Between Raspberry Creek and the wetslide area, the flanks of the Hermit Range are steep, somewhat irregular and cut by several creeks and avalanche paths. In response to the increasing irregular terrain and the need to build a 9,000-foot long siding, the design calls for numerous large cuts and fills. Large fills will be required to construct the line across Surprise Creek at a sufficient elevation to clear the Creek, and several major cuts and fills will be constructed at the creek and avalanche paths.

This section of the line will be more visible than most of the previous sections because the terrain is steep and there is less foreground vegetation to provide screening. As you can see there is little foreground in this area. As well there are more opportunities to view the area as seen in this photograph from the highway pull-off. Nevertheless, through numerous alignment modifications we have tried to minimize the more visible cuts. Also this area has the most extensive use of retaining walls. Approximately, 4,000 linear feet will be installed to minimize the extent of cuts.

Retaining walls would also be built of exposed aggregate or textured concrete or possibly sprayed with asphalt emulsion to harmonize the colour with the existing environment. As well, the planting of natural grasses, trees and shrubs

(MacGregor)

in the area, as Mr. Polster will outline later, will restore the native colour and texture to the cuts and fill slopes and enable them to blend into the natural environment.

Between the wet slide area and Stoney Creek, the forested slopes of the Hermit Range are steep and irregular. This is one of the most visible sections of the surface route. In recognition of the potential for serious visual impacts several major changes were made during the design process. Fills were emphasized as much as possible to reduce the number of more visible cuts. In areas where screening vegetation was sparse or would be destroyed by conventional cut and fill construction, the design called for a bridge structure at Stoney Creek as well as 1200 linear feet of retaining walls.

To build a stable line across the wet slide area, the cuts and fills will be flattened 2 to 1. This will facilitate the task of reclaiming the area. In order to reduce the size of the cuts required beyond the wet slide area, retaining walls of dark concrete will be built on both up slope and down slope sides of the line to protect the existing vegetation. Approximately 700 feet of bridge structure will also be built to prevent large fills that would have been created in order to get the line across the large gully preceding Stoney Creek. Reclamation vegetation

(MacGregor)

in this area will soon surround the structure and integrate it into the landscape. In addition, a major effort to renaturalize this area will be made by the reclamation people resulting in a naturally coloured and textured slope that resemble the local environment.

From Stoney Creek to the east portal of the short tunnel, the flanks of Hermit Range are extremely steep and difficult for construction. In the visually sensitive Stoney Creek area, the alignment was pulled out from the valley to reduce the size of what would have been a very large and visually obstrusive fill. In recognition of the steep, irregular terrain and the magnitudes of the cuts and fills that would be required to carry the line, the design calls for approximately 6,700 feet of bridge structure. It will average 25 to 30 feet in height, but for the most part will not be visible from the highway, as it will be hidden behind the trees that are approximately 75 to 80 feet tall. Consequently, there will only be a minor visual impact in the area.

The decision to use the bridge structure rather than conventional engineering techniques means that what would have been by far the largest disturbance along the entire surface route will hardly be perceived by the travellers

(MacGregor)

along the Trans Canada highway.

Finally the east portal of the short tunnel will be in tall trees above the highway and will not be visible from the road.

In conclusion I have attempted to give a visual description of what the line will look like soon after construction. I have emphasized that large cuts and fills at Mountain Creek Terrace, Raspberry Creek, the wet slide area, the avalanche paths and Stoney Creek will be treated with retaining walls and an intensive reclamation program. Other areas that are not so visible nevertheless will also be completely revegetated immediately after construction in order to prevent erosion. Within a few years after construction the line will be perceived as a dark green band, wider, but in many ways similar to the existing line that now crosses the lower face of the Hermit Range.

I would like to terminate my presentation with a brief outline of the various design parameters or mitigative measures that are meant to assume a reasonable and acceptable integration of the new lines into the visual environment of the Beaver River Valley.

B-1

(MacGregor)

The first one is of course alignment changes and I have already discussed that many times. These were the changes that were made during the design process to minimize cuts and fills and to of course protect existing vegetation. Number 2 is the use of retaining walls. Approximately 100,000 square feet of retaining walls has been used especially to minimize the extensive cuts and consequently, the removal of upslope vegetation. They were also used on fills to protect trees when possible. Downslope walls will be reinforced earth or bin walls, and tied back walls will be used on the upslopes.

All visible retaining walls will be of exposed aggregate or sprayed with an asphalt emulsion to assume a dark grey colour that integrates into the environment.

Trestles and bridge structures. A 700 foot long structure will be used in the Stoney Creek fan area. North of the creek a very special and incidentally costly effort has been made to eliminate the large fills that would have resulted under the normal construction techniques at Stoney Creek. The addition of this less intrusive bridge structure therefore represents a significant effort to protect the visual resources of this sensitive area. Of course, the 6,700 foot trestle will also have a similar impact.

B-2

(MacGregor)

Earth barriers at the Mountain Creek terrace. The proposed alignment passes within a few hundred feet of the Mountain Creek campground. It is therefore proposed to construct a 20 foot berm between the campground and the new track. The shape of this 800 foot long land form will be natural and reflect the gentle rolling land forms of the area. The berm will be landscaped with local vegetation; as I mentioned the renaturalization will be with between five and six foot high trees.

As well all edges at the limits of the cuts and fills will be rounded off to prevent sluffing and to create a landscape form that is more natural.

I have made frequent references to reclamation, as it will represent the most major effort to enable a successful integration of the proposed line into the visual environment, and Mr. Polster will be following our presentation with more details.

However, I would like to emphasize a few points. Firstly, vegetation planting layouts will have an organic or natural form to blend into the existing environment. Secondly, renaturalization will start immediately after construction. As well, areas of high visibility will receive the most attention, that is, native trees will be used to recreate an instant landscape effect, and finally,

B-3

(MacGregor)

asphalt emulsions have been proposed on exposed rock cuts as a one shot application to minimize the visual impact of the high contrast rock in the few years after construction. Following that renaturalization will establish the conditions to its former situation.

Finally, a responsive monitoring program has been set up by C.P. Rail to ensure its commitment to the protection and revegetation of the Park landscape. Professional landscape architects and reclamation specialists will be on site during the various phases of the construction and their responsibilities will include firstly responding to unforeseen circumstances, assisting in the location of retaining walls, determining the exact landscape planting layouts, and of course making regular reports to Parks Canada.

The monitoring program, as outlined in the red book, is only a guideline and a more definitive schedule will have to be coordinated with the contractor.

In conclusion, it has been assessed that the new line will have a definite and permanent visual impact on the Beaver River Valley. However, after reclamation, the impact will not be significantly greater than the existing line. All efforts were made at the design stage to minimize the disturbance to the landscape and to protect existing vegetation.

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(MacGregor)

That consciousness will be maintained throughout the construction phase and assured by a monitoring program.

We trust that the visual impact assessment document and the exhibit panels clearly indicate these intentions. Thank you.

I will now ask Mr. Haggerstone to present the ventilation shaft.

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(Haggerstone)

MR. BRUCE HAGGERSTONE (MacLaren Plansearch Corp.): Good morning, Mr. Chairman, members of the Panel, ladies and gentlemen, my name is Bruce Haggerstone. The study I am about to describe was conducted by MacLaren Plansearch in response to a request by the Panel for further investigation of the possible visual impacts of the ventilation shaft structure.

The objective of our study was to evaluate the potential impacts of the structure on views from the Glacier Park Lodge, the Summit Monument and the Trans Canada Highway.

This presentation outlines the methods and results of that study.

The features of the area that I will be discussing are: the start of the ventilation shaft access road, right about there; the existing clearings for the structure and the access road itself: the Glacier Park Lodge; the Summit Monument, hidden just behind the trees; and the summit of Rogers Pass itself, which is right about there.

The site for the vent shaft structure this is the existing clearing, is a bit less than a quarter of a mile from the nearest point on the highway, about a half a mile from the Summit Monument and more than a mile from the Glacier Park Lodge, and I am dealing with line of sight distances here.

Existing clearing for the vent

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(Haggerstone)

shaft structure is over 200 feet wide, about 400 feet long and surrounded by trees that range from 65 to more than 80 feet in height. That is this clearing.

The structure itself will be about 300 feet long and 100 feet wide. Although the maximum height of the two vent stacks above natural ground level will be 80 feet, the majority of the building will be less than 60 feet tall.

Visuals impacts were assessed for visitors travelling the highway as well for those stopped at viewpoints. However, recognizing that visitors outside their vehicles will be more aware of the landscape than those driving by, we concentrate our assessment efforts on the viewpoints.

Views from the two major locations where visitors leave their vehicles -- the Glacier Park Lodge and the Summit Monument, again just behind the trees -- were assessed in considerable detail.

The third location that was studied in depth was the start of the vent shaft access road, right about there. Although not a viewpoint and located on a curve on a hill where there are three lanes of traffic and no provisions for parking, it is the closest approach to the vent shaft structure for highway users.

The studies were conducted in several stages. C.P. Rail field staff conducted ground surveys to measure the heights of the trees around

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(Haggerstone)

the clearing for the vent shaft structure, and to determine the elevation of the test site and its location with respect to siting of the structure. I will refer to this test site in a moment.

The elevations of tops of some of the surrounding trees and some of the key points on the structure are shown in this true scale cross-section. The vent shaft structure is here; the elevations in feet above sea level of the tops of the trees and the bases of the trees, and the location of the highway and a viewer are shown in this section. This is one of the panels that is in the room.

Red helium-filled balloons were tied in the clearing at the height of the tops of the vent stacks. The string of balloons here is ten feet from top to bottom. The balloons are about a foot and a half to two feet in diameter. The line has been marked in ten foot increments, and unfortunately with the lighting we cannot see them, but I had marked on this line with red survey flagging every ten foot increment.

To reduce the possible effects of wind, the balloons were guyed on three corners to reduce their movement and the studies were conducted very early in the morning on a relatively calm day.

The area was then observed from the highway and the viewpoints to determine the locations

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(Haggerstone)

from which the structure might be seen, and here peaking just through the gap in the tops of the trees right at the tip of the arrow is the top of one of those balloons. In this photograph the balloon is just visible.

Perspective drawings of the vent shaft structure, as it would appear from selected observation points were then prepared using C.P. Rail's computer systems in Calgary.

These perspective views were combined with photographs to simulate the actual location of the building in the landscape. This may not be perceptible to people in the back, but that line drawing that I previously showed has been superimposed on this photograph and you can see the outline of it here. This is the location of the balloon for reference purposes.

This computer graphi photomontage was then used to estimate the portions of the tops of the vent stacks that could be visible, here shown in grey. Note the location of the balloon for reference.

Our assessment of the possible visual impacts on visitors at viewpoints dealt with views from the Glacier Park Lodge and the Summit Monument. The existing clearing was not visible from just outside the dining room window ot the Glacier Park Lodge, which is where this photograph was taken.

B-9

(Haggerstone)

This is the recently constructed Parks Canada Interpretative Center. The ventilation shaft structure, were it visible, would sit in about that location. The balloons were barely visible through gaps through the tree tops, but they were so small that they are not visible on the photograph.

This telephoto shot shows what you would see if you used small binoculars. The balloons were very slightly visible right at about this location, but unfortunately again, they are not visible on this particular slide.

The foreground vegetation comes very close to blocking the view completely, and from many locations near the hotel these balloons were not visible. I might add here that I am at the parking lot right outside the hotel at this point and you can see those balloons just above the top of the trees if you know where to look. However, if you are down on the highway, these foreground trees completely block that from view.

This computer graphic photomontage shows where the building would sit in the landscape. It shows where it would be in the forest. That is the outline of the building there. The balloons are virtually invisible. The existing clearing was not visible at all from that point, and I again would emphasize, that clearing is 400 feet long.

In this simulation, the grey represents

B-10

(Haggerstone)

the portions of the structure that could possibly be visible. As you can see, it would be almost impercep[illegible] since it will be more than a mile away and the visible portions of the tops of the stacks will appear very small as a result of that distance.

The line of sight distance from the Summi[illegible] Monument to the vent shaft structure is approximately half a mile. The existing clearing is not visible. Now, I could not find it even when I knew where it was. Now, Peter Holubar said he could see it, but I could not.

The balloons are barely visible through a gap in the tree tops, and I apologize for the darkness of these slides but I had to do this study about seven o'clock in the morning before the winds picked up.

This photomontage shows the location of the proposed structure in the forest, and I point out again that these photographs are all on the panels if you cannot see the details of them.

The existing clearing was not visible to my eye from this location and I found the balloons were barely visible through a gap again in the tree tops.

This is the balloon again, for reference. This is the view from the Summit Monument. In this simulation, the light grey areas represent the probable extent of the visual impact of the vent

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(Haggerstone)

shaft structure on the view from the Summit Monument. This grey area represents about a ten foot segment of the top of the vent stacks. I should point out that we have recommended that the building be a dark, non-reflective green to further minimize any visual impacts.

The trees in this area range in height from 65 to more than 80 feet. The building design is such that most of the structure will be hidden from view, but portions of the top few feet of the vent stacks could be visible through gaps between the tree tops.

Mr. Chairman, I would like at this time to call your attention to an error in the red book on page 23 and maybe I could bring this up again when we are reassembled. It refers to a couple of words. Would you prefer that I brought this up when we are back at the tables and you have the book?

THE CHAIRMAN: You might as well mention it now.

MR. HAGGERSTONE: The last sentence, the word "is" should be replaced by "could be" and the word "tall" should be replaced by "shorter". The sentence should read: "Only a few feet of the structure could be visible above the shorter trees." The key words were "is" and "tall".

This true scale cross-section along a sight line from the Summit Monument shows how the

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(Haggerstone)

trees will screen almost all of the building from view. Note that the structure will not be visible if some of the taller trees happen to stand between it and the observer. This tree right here, for example, is taller than the top of that building if you are standing there.

While at the Summit Monument, I found that due to these variations in the tree height, from some places I could see my balloons and from other places I could not as I walked around, and as I moved around it was visible and not visible.

To assess the possible visual impacts on visitors driving through Rogers Pass, we first considered the eastbound travellers, people who would be approaching the Pass from the west, coming up the hill into Rogers Pass.

Views of the site from the bottom of the hill leading to the pass blocked by the southeast ridge of Mount Cheops. From this location, the shoulder of this mountain blocked the view. From part-way up the hill, the views were blocked by the lower slopes of Avalanche Crest. From this location here, views were blocked by the terrain.

For the rest of the climb into the Pass, the views were blocked by dense stands of 65 to 80 foot tall coniferous trees that line the highway, these trees here. The sight distance from the start of the access road to the structure itself will be

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(Haggerstone)

about 1200 feet, slightly less than a quarter of a mile. The exception to that blocking is the clearing at the entrance to the access road to the vent shaft.

From this access road to the vent shaft, the existing clearing is not visible. The top balloon is just visible here through a gap in the tree tops.

In this photomontage that I showed before shows the location of that building in the forest, and the light grey areas show the portions of the building that would be visible from that location -- could be visible from that location.

This true scale cross-section along a sight line from the start of the access road shows how the trees will screen almost all of the building from view. As the trees continue to grow, this foreground screening will of course before even more effective.

The most important consideration is that few people will view the structure from this location since it is on a curve near the top of a hill, as I pointed out previously.

We concluded that, with the exception of a brief glimpse through the clearing at the start of the access road, the vent structure will not be visible to eastbound highway travellers approaching the summit of Rogers Pass.

Westbound travellers coming from this direction, coming from Calgary enroute to Vancouver,

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(Haggerstone)

might see small portions of the tops of the vent stacks from the short stretch of highway between the Glacier Park Lodge and the Summit Monument. Around this corner from about here to the Summit Monument you may get small glimpses similar to the views from the Glacier Park Lodge.

However, the visual impacts will be minimal since the visible portions of the structure will appear very small, there are scattered clumps of trees that block the view in some locations along the highway here, and most of the viewers will be in moving vehicles with their attention directed down the highway rather than along the side of the mountain.

In summary then, our study revealed that, one when viewed from the Glacier Park Lodge, the ventilation shaft structure will be virtually imperceptible; two, the visual impact of the structure on the view from the Summit Monument will be small; three, the vent shaft structure will not be visible from any point along the highway west of the access road; four, the visual impact of the vent shaft structure on the view from the start of the access road will be minimal; five, the visual impact on travellers westbound from the Glacier Park Lodge will also by minimal; and six, the screening provided by vegetation is essential in minimizing the visual impacts and as these trees continue to grow, the

B-15

(Haggerstone)

screening in all areas will become even more effective, barring of course the spruce park beetle or whatever it was we heard about.

That is the end of my presentation. I would now like to turn it over to Mr. Dave Polster.

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(Polster)

MR. DAVE POLSTER (Norelco): Mr. Chairman, members of the Panel, ladies and gentlemen, I would like to present a brief overview of the reclamation program proposed for the grade revision through Rogers Pass. Inasmuch as the task of reclamation for this project is going to be a major undertaking, I would like to outline the major components of the porgram. I will present the detailed plans and contingencies for two major cuts and fills as examples.

Specific program details for the grade have been included in the brief prepared for these meetings, and I trust you have had an opportunity to review these. I will be pleased to answer any of your questions in regard to the conduct of the reclamation work during the question period.

The reclamation plans for the surface grade have been developed with input from the visual impact assessment, the biophysical studies and the engineering studies. The plans outline the procedures which we will be using to conduct the reclamation work. We fully expect to have input from a range of specialists during the conduct of the work. This diagram illustrates the inter-relationships of discliplines.

The reclamation program has been designed to harmonize with the surrounding landscape. I will digress briefly to give you an overview of those

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(Polster)

features of the terrain, natural vegetation and successional patterns which were integrated into the reclamation plans. As the major part of the reclamation program will be conducted in the Beaver Valley, I will be speaking primarily of this area. I will touch briefly on those aspects of the vent shaft site and the west portal area which are important to the successful reclamation of these sites.

The surface grade will run along the lower slopes of the Beaver Valley. Natural slopes in the area are generally steep. The vegetation cover is a mixture of late to mid seral forests of western hemlock, Engelmann spruce, western white pine, subalpine fir, lodgepole pine, Douglas fir, western red cedar, aspen and cottonwood. These forests are broken by several avalanche tracks. Bogs occur on the valley bottom while narrow bands of alluvial vegetation occur along the streams. Grass-lands do not occur in the area although herbaceous meadows are associated with the avalanche tracks. Shrubs such as alder, red osier dogwood, thimbleberry and willows as well as trees such as aspen, cottonwood and paper birch paly an important role as early successional species. In some cases the shrub stage of the successional forest is skipped entirely and hemlock, cedar and subalpine fir invade disturbed sites directly. I would like you to keep

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(Polster)

these various successional stages in mind as I go through the reclamation plan.

Two major objectives have been developed for the reclamation program. The first being the revegetation of exposed erodible materials to minimize erosion and subsequent water quality degradation; the second being the amelioration of the visual impacts of cuts and fills through the use of vegetation.

In addition, two subsidary objectives have been developed which follows from the major objectives. The first one being the establishment of a self-sustaining vegetation cover which is compatible with the naturally occurring vegetation in the area; and the use of species native to the Park where this does not compromise the other objectives.

There are four major components of the reclamation program: Development of a suitable rooting medium and seed bed for germination; establishment of an erosion controlling grass/legume cover; establishment of a permanent cover of woody species; and the maintenance of the reclaimed sites to ensure success.

I will briefly outline these aspects of the program, after which I will describe as examples how these will be pulled together to reclaim two of the major cuts and fills.

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(Polster)

The development of a substrate which will sustain plant growth is critical to the success fo the reclamation program. A program of top dressing those materials with a low suitability for plant growth was developed in order to provide suitable growth media for the revegetation species.

I will briefly outline the procedures used in the development of this aspect of the reclamation program.

The surface grade was initially subdivided into about 40 landform units by Thurber Consultants. We heard about this yesterday. These units formed the basis for assessment of reclamation suitability. Reclamation suitability was assessed primarily on the basis of texture, although the nutrient status of the various materials was also assessed. Three classes of reclamation suitability were used: high, moderate and low. Materials with high and moderate suitability can be used as top dressing, while the low suitability materials should themselves be topped dressed.

Tables were prepared outlining which materials should be salvaged for use as top dressing and which sites will require a top dressing. Detailed plans have been developed for determining mass hauls, schedules and how construction will proceed. Top dressing salvage and disposition was one of the many factors considered in the development of these plans.

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(Polster)

We recognize that care will be required to ensure that the top dressing program is conducted in a manner which will provide the best possible growth medium for the revegetation species.

The next phase of the reclamation program following establishment of a suitable growth medium will be to prepare the sites to receive the initial seed and fertilizer. The major aim of site preparation is to break up any surface crusting which has developed and to provide a loose surface which will catch the seed and fertilizer and provide sites suitable for germination. A number of methods have been used for preparing industrial sites for reclamation. Floating pipestem harrows, clodbusters, which are like spiked chains, and teeth on backhoe buckets have all been used for preparing seed beds. Frost action also serves to loosen the soil surface. We expect that we will use a variety of methods for preparing the seed bed, depending on the site.

In order to ensure erosion is minimized and a green colour is rapidly established, we propose to develop a grass/legume stand on the disturbed sites as an initial cover. This will be established from seed after preparing the seed bed. We plan to use two methods for seeding: broadcast and hydroseeding, depending on the site.

Broadcast seeding, where seed and fertilizer are spread dry either from handheld seeders

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(Polster)

or from helicopters, will be used in most cases. However, hydroseeding where seed and fertilizer are spread in a slurry with water and mulch, will be used in cases where there are mixed bedrock and soil slopes, where the materials are expected to be particularly susceptible to erosion, or in situations where broadcast seeding would not be as effective.

Seeding methods will be determined on a site specific basic. I have outlined general choices in the brief.

The seed mixes we have selected have been designed to provide an optimum cover rapidly. The seed mixes have been balanced to provide the percentage of pure living seed listed in the percent by species composition column. Percent by weight is given so that the seeds can be ordered directly from the seed dealers. I would like to point out several aspects of seed purchase which may help to allay any fears which may exist with regard to seed.

First of all, the seeds which are used in the mixes will be Canada No. 1 grade or better. This will reduce the possibility of introducing weed species. Also, it makes economic sense to use the best seed available, as the cost of seed is small in relation to other reclamation costs, just as you would not buy a fancy Porsche and then put cheap recaps on it. I should also point out that all legumes will be inoculated with the appropriate

B-22

(Polster)

nitrogen fixing bacteria.

We will be fertilizing the reclamation sites for establishment of the initial cover. We may apply the potassium and phosphate just prior to site preparation work to incorporate it into the growth media. Soil samples will be collected and analyzed to determine the appropriate fertilizer application.

(Polster)

As with seed it does not make much sense to scrimp on the fertilizer although care must be taken not to apply too much.

As I mentioned earlier, one of the objectives of the reclamation progream is the esta- blishment of a permanent vegetation cover. We feel that the best way to ensure that we have a permanent cover is to re-integrate the disturbed sites into the natural successional processes which occur in the Park. For this reason we will be planting early successional species such as alder and cottonwood as well as climax species such as hemlock, cedar, spruce and fire.

Planting patterns have been designed to harmonize with the surrounding vegetation as much as possible, although we will not be planting trees near the tracks as they would only have to be removed a few years down the road. Detailed planting designs were prepared for a number of sites along the new grade. These incorporate the criteria set out by the landscape architect to reduce the visual impacts. For the most part we plan to use container grown stock . However, in some areas, such as through the Mountain Creek gravel pit, we will be using larger stock so that the visual impacts are minimized as quickly as possible.

We will be initiating seed

(Polster)

collections this year in order to ensure we have stock available for the spring of 1985 when we plan to be doing our first plantings.

The final Phase of the reclamation program will be the maintenance of the reclaimed areas. Although the program has been designed to minimize the need for maintenance, we expect there will be some situations where maintenance such as re-fertilization, re-seeding or re-planting of trees and shrubs will be needed to achieve the desired reclamation results. The maintenance program will also ensure that problem sites, such as erosion gullies do not have a chance to get firmly established but are repaired quickly. We feel that by properly attending to any problem sites which develop we will be able to minimize the adverse effects on both the visual and biological environment.

I would like to discuss surface erosion for a moment so we get this aspect of the job into proper perspective. Erosion rate of from 45 to 90 tons per acre have been reported in the literature for logging roads in B. C. and Oregon. Rates of up to several hundred tons per acre have been reported for highway cuts in the U. S. We expect the erosion rate for the new grade to be less than this range as we will be implementing measures such as immediate revegetation to reduce erosion.

(Polster)

I should also point out that the side slopes on the new grade will be as steep as those of the existing access road which are comparable to the typical logging roads. In any case, we will be monitoring erosion rates closely and can apply additional measures as required. We will be using a rill meter and following procedures set out in the literature for these erosion measurements.

Now that I have outlined the general procedures we will be using, I would like to describe how these will be applied in two specific examples. I have purposely chosen two of the most sensitive sites. Although we do not have time during these hearings to go through the entire line in detail, I hope you will see the ways in which we will be approaching the reclamation of the cuts and fills along the grade through these examples.

My first example is the Mountain Creek Pit cut. As you are aware, the new grade will traverse the existing Mountain Creek Pit resulting in a large cut. James MacGregor has explained how this cut will be a visual impact when viewed from Heather Hill. By working with James we have developed a reclamation design which will minimize this impact.

(Polster)

Let me begin by explaining how we expect this cut will be constructed, as I think it is important to have an understanding of the construction methods in order to appreciate how we have dove-tailed the reclamation with the construction.

First of all, the upper limits of the cut will be surveyed and flagged. Clearing crews will then remove the vegetation and the site will be grubbed to remove the roots and stumps. A tote road would then be constructed along the top of the cut. This would be to allow access for the scrapers. From this initial bench the material would be cut with scrapers. A front-end loader and trucks would be used if the material is to be hauled a long distance, and this depends on the construction mass balances.

In any case the results in terms of the cut surface will be basically the same. The rough cut surface will be developed in stages of about 30 feet so that top dressing can be placed on the cut while there is still access. The top dressing will be hauled along the access bench and dumped for placement with a backhoe. If the top dressing material is too wet to spread effectively, it will be left on the bench to dry out. In any case, the rough cut slope will not be smoothed so that the one to two foot

(Polster)

horizontal ridges which developed during the cutting will remain to hold the top dressing on the slope. A one foot layer of top dressing will be applied. Further cutting of the slope can then continue. The process will be basically a repeat of the one I just outlined.

Now let us impose the seasonality of construction on the whole process. Let us say we get to the end of October and the construction season is winding down. About one half of the slope would be completed with the top dressing. I should mention that when we have the backhoe operator placing the top dressing on the slope, we will get him to swing his bucket back and forth along the slope so we get little horizontal ridges on the top dressed slope. Anyway, in this case, we would probably rely on frost action to ensure the site is loose enough to allow the seed and fertilizer to lodge. Seeding and fertilizing would be conducted using a helicopter as it is likely there will be a fair amount of area ready for seeding throughout the entire surface route.

We would be using the dry site seed mix in this case. Soil samples taken about one month prior to the seeding and fertilizing would be used to determine optimum fertilizing rates. The seeding and fertilizing would complete the reclamation of this site for that year.

(Polster)

Early the following spring, just after the snow leaves the site, the second phase of the reclamation program would begin. This would entail the planting of trees and shrubs as well as assessment of the condition of the slope to detect the presence of excess erosion, and this is when we would be monitoring with our rill meters. Because of the very visible nature of this site, we plan to use scattered clumps of larger trees as well as the standard planting of container grown stock. We plan to plant about five clumps of the larger trees with 10 to 20 trees in each clump per acre. These larger trees would have been collected and balled in the fall, prior to freeze-up, and stored in the sand near the site. The landscape architect would be on site during this phase of the work to ensure the plantings are done with maximum regard for amelioration of the visual impact.

The second year of construction would proceed in the same manner as the first. We expect that the cut will be completed down to the subgrade and that the noise berm would also be completed. The fall program would again entail seeding and fertilizing following in the spring by tree and shrub planting and site monitoring.

Let us look for a moment at what methods might be used in the event that the spring inspections turned up problem sites, such as

(Polster)

excess gullying. Let us say we have a worst case situation where there are erosion gulleys which have cut through the top dressing material down to the ground level material of the cut. It is unrealistic to expect the gullies would extend into the gravel for any distance. Anyways the first stage of repair would consist of crews on the site with hand tools to fill the gullies and reshape the slope. This will be followed by reseeding and fertilizing the reshaped gullies. If we suspected that problems were likely to reoccur, we would consider an application of soil binding spray. It is recognized that this procedure would be labour intensive, however, short of getting a machine on the slope, which risks disturbing the surrounding areas, there is little else which could be done. We are prepared to incur the expense of such hand work for the benefit of rapid repair of problem site.

Monitoring of the site would continue for several years after the reclamation is complete in order to ensure the vegetation was firmly established.

My second example is the wet slide area. The soil materials in this area are suitable for plant growth. Therefore, top dressing would not be applied. Also in order to ensure due technical stability, slope angles have

(Polster)

been reduced to 2 to 1. This will allow machine access across the site for site preparation. Site preparation would consist of harrowing across the slope with a pipestem harrow. This will be followed by broadcast seeding using the moist sites mix and fertilizing. Tree and shrub planting in the spring would utilize moisture-loving species such as cottonwood, cedar and hemlock. Direct planting of unrooted willows, red-ozier dogwood and cottonwood may be used pending the results of work currently being done at Lake Louise, and those results are quite promising at present, but we will see how it goes.

This site has a greater potential for surface erosion than most due to the deep fine textured materials. We will be monitoring the site closely to ensure that erosion does not become a problem. Soil binding sprays and some of the bioengineering techniques, which I will be discussing shortly would be used if problems developed.

I hope these examples give you an idea of the reclamation we are planning. I should point out that detailed plans, such as I have shown, have been formulated for all of the major cuts and fills. These are included in the reclamation plan report.

I would like to take a few minutes to outline some of the special reclamation

(Polster)

techniques which we plan to use to establish vegetation in some of the more difficult sites. Of particular importance are the areas adjacent to water channels, steep side slopes along the grade from Stoney Creek to the east portal of the short tunnel, and areas where the soils are particularly prone to erosion; that is, they are silt areas. Most of the techniques I will be discussing fall into the realm of bioengineering. The practice of bioengineering is relatively well established in Europe, however, there are only a few examples of bioengineering in Western Canada, one of which is in Glacier National Park.

Brush layering is a technique which can be used to establish shrubby vegetation on steep slopes. This method was used successfully on the abutments of the recently constructed avalanche shed near the Pass, where this photo was taken. Living, unrooted cuttings of willows were used in this case. However, willows, cottonwood and red-osier dogwood would all work. We would be using this technique near the bridge abutments along the new grade. Hedge brush layering is a similar technique but in this case rooted shrubs are planted in with the cuttings. Alder would be a prime species in the Rogers Pass to include in a hedge brush layer.

(Polster)

Another bioengineering technique called live pole drains could be used to provide drainage on slopes. This technique uses bundles of living cuttings placed in ditches and covered with a thin layer of soil. The idea is that the water flows through the bundle and eventually the cuttings take root and grow, drawing moisture from the soil by transpiration.

Soil binding sprays such as Deci 162, which is a polyurea polyalkylene oxide can be used to stabilize soil surface until vegetation can be established. Although these materials are relatively expensive, they can perform an important function in certain circumstances.

In the same vein, soil holding fabrics and meshes can be used to hold the soil until vegetation can be established. We plan to test the effectiveness of a variety of these techniques this summer.

This brings up the topic of what we are presently doing and planning in terms of reclamation. As you are no doubt aware, we initiated a program of reclamation testing a year ago with the establishment of operational reclamation trials on the slopes of the east cut at Mountain Creek. The slope we selected comprises the most challenging set of site conditions of any site expected on the new grade. It is south facing and therefore gets very hot in the summer. Soil surface

(Polster)

temperatures live up to a 130 degrees, it has been mentioned. It is very steep, about 36 degrees or 1.35 to 1, steeper than any of the slopes in the new grade. It is gravelly and generally not a good place to try and get vegetation going. In fact, I was told by C. P. that they were not so concerned about testing the species as they were of testing the reclamation expert.

I am happy to report that the first year's results were very encouraging. With the exception of the loss of some of the planted shrubs due to record high temperatures last spring, we have managed to get a good stand of grasses and legumes growing on the slope.

Last fall we continued our operational trials with the application of seed and fertilizer to selected sites along the surface route. This is an off center line drill hole that was put down. This was just as the snow was melting in the spring and this was a couple of weeks ago. You will recognize this as the east portal, the reinforced earth retaining wall - last fall, and this spring. The Soper Creek. I hope you have had a chance to see for yourselves the results of these trials.

This spring we were again on the site cleaning up the damage caused when part of the access road slid down the slope. We plan an extensive reclamation program for later this

(Polster)

summer which, as I alluded to earlier, will include trials of slope stabilization techniques along the access road. We also plan to revegetate the slopes along the vent shaft access road and the completed portions of the east and west portals. This time we will be testing the effectiveness of a late summer planting period which, if successful will further extend the times during which reclamation work can be conducted.

I would like to comment briefly on the revegetation of steep slopes and this slope here is on the order of about 40-41 degrees side cut slope. There was no special site preparation work done prior to seeding to loosen the surface or anything on this slope.

This slope,which most of you from the Park will recognize as being just outside the east gate, is one and a half to one and, in fact, this shows a fairly good example of what we anticipate the slope would look like with the grasses near the track bed and, of course, we are going to try to minimize the introduction of dandelions. Trees and shrubs further up the slope. I should point out that the trees and shrubs in this case were all volunteers as far as I know. There was no special attention paid to planting trees or shrubs in this area. Similarly there was no special attention paid to top dressing materials or any of the assistance

(Polster)

we are proposing.

This slope is a face-on view of a rock fill slope just adjacent to Mountain Creek campground. In fact, right across from the Mountain Creek cuts I was just describing. It is an angle of proposed slope, 37 degrees. It is shot-rock from the slope above. No top dressing and the vegetation establishment is purely volunteer. 37 degrees is 1.3 to 1 approximately.

I realize I have covered a lot of ground in this presentation. I hope I have answered any further questions you might have, however, I would be pleased to answer any questions you might have or to elaborate on any aspect of the planned reclamation program. I would like to thank you for your kind attention.

Actually I should mention a few other things. I was handed last night a copy of the statement by the Panel's expert on reclamation in which he suggests reclamation standards be applied, and with a few exceptions, we agree to those standards, and I suspect this will be coming up after his discussion. Thank you.

--Brief adjournment.

THE CHAIRMAN: We will now recommence with Mr. Walker's presentation and then we will get into a discussion. I guess the one thing we need here is C. P. and I have not seen them back yet.

(Walker)

DR. DAVID WALKER (David Walker & Associates Limited):

Thank you, Mr. Chairman, Panel Members, C. P. and Ladies and Gentlemen:

This is the second technical review that I have made of the C. P. reclamation plan. The first was only of the consultant's report and this review is primarily of the -- this second review includes the C. P. R. Red document, which has some revisions to the technical plan and more commitments made.

The review is presented in two sections. One is the technical review and the second section will be suggestions for reclamation standards, which could be adopted by Parks Canada and C. P. Rail in order to define what an acceptable reclamation job is.

The objectives of the reclamation plan presented by C.P.R. is excellent. A herbaceous plant cover sufficient to control erosion has been proposed. Recognition has been given to the fact that the coarse textured soils distributed locally along the route have a low moisture holding capacity and top dressing with material containing an acceptable proportion of fine textured particles will help mitigate a potentially droughtly soil condition. Transplants of indigenous trees and shrubs have been proposed in order to re-establish a native plant community.

(Walker)

The plan indicates that a self-sustaining plant cover will be developed and the need for ongoing maintenance will be minimized.

The first technical review raised a number of questions concerning the revegetation plan. Some of these have been answered in the most recent C. P. Rail submission by amendments or by providing more information. Despite these changes, however, serious doubts exist as to the ability of the plan to achieve the stated objectives. The following points outline the major questions.

First, Erosion Control:

The establishment of a cover of vegetation has been proposed as the most effective and only method of controlling sheet erosion. During the period of plant establishment average erosion control effectiveness of a rapidly establishing perennial grass has been measured to be maximum of 60 per cent. The period of plant establishment may take as long as 12-16 weeks under the climatic conditions in Rogers Pass. Even low rates of soil erosion result in a seeding failure because plants are uprooted.

The C. P. Rail revegetation plan proposes that additional erosion control measures may be applied if required. The additional measures have been described in the vaguest of terms and no comment can be made as to the effectiveness. For

(Walker)

example, a straw mulch has been mentioned without reference to rate of application, source of material, method of application, or the system of ensuring adhesion to the slope. Soil binders have been referred to without providing details on type, application rate, and method of application. Hydroseeders have a limited range of application upslope.

The plan lacks criteria for identifying an acceptable level of erosion form that is unacceptable. Criteria are also lacking for the choice of mitigation measures. This absence of guidelines exposes the reclamation plan to differences of opinion of the definition of successful reclamation. In addition, an unsuccessful initial attempt at reclamation may result in rapidly escalating costs which may force abandonment of the original objectives.

The second, is Self-sustaining plant cover: In the past 10 years, considerable effort and reclamation research has been devoted to the achievement of a self-sustaining plant cover on drastically disturbed lands. The establishment of grasses and legumes or of transplants of native shrubs and trees will not in itself provide a self-sustaining permanent plant cover. The problem is a soil nutritional one and repeated applications of fertilizer will almost certainly be required. B.C. Coal Ltd. of Sparwood has supportedconsiderable

(Walker)

reclamation research to determine the length of time required and the soil characteristics necessary for a reclaimed area to be self-sustaining. Definitive answers have not been found.

The reclamation maintenance program referenced in the C. P. Rail submission and outlined in the Norecol Reclamation Plan appears overly optimistic in relying on nitrogen-fixing legumes to reduce the need for repeated applications of fertilizer. Full appreciation does not appear to have been given to the fact that reclamation of other similar disturbances in the mountain regions of Western Canada have required lengthy periods of intensive management.

The reclamation plan examined the salvage of suitable surficial organic material for use as top dressing, and by that I mean top soil. C. P. Rail is strongly encouraged to commit to this wherever possible. Replacement of surficial soil material, containing even diluted amounts of topsoil, will be of such benefit to revegetation that Parks Canada should consider extra right-of-way requirements for temporary storage of the material if it is logistically required.

Sub-surface material has also been considered for top dressing. Some sub-surface material excavated to provide a firm foundation for the railway bed may not be better for plant growth than the material already on the surface. Material high in

(Walker)

silt and fine sand is highly erodible and its use as a top dressing would increase the erosion potential on steep slopes and the risk of sedimenting aquatic habitats. Unless the excavated material is substantially better for plant growth it should not be top dressed as a means of disposal. Under such circumstances, Parks Canada should consider foregoing the policy of balancing earth quantities in favour of disposal at an inconspicuous location, and my rationale for that is if it is going to erode off the slopes into the woods, you might as well know exactly where it is going and dispose of it in an acceptable place.

Establishment of vegetation:

The method of establishing a grass/legume cover outlined in the Norecol Reclamation Plan is not adequate to ensure a reasonable probability of success. The potential adverse effects of erosion during plant establishment has already been mentioned. Other problems likely to occur and not adequately addressed in the plan are outlined.

Time of seeding:

Fall seeding is not expected to result in adequate plant establishment because seed will be washed downslope during spring run-off. The problem cannot be mitigated by elevated seeding rates. A suggested alternative is to restrict fall seeding

(Walker)

to areas with very coarse-textured soils. The period of seeding could also be extended, in my opinion, from early spring through to August 1.

Reliance on Remedial Seeding: Despite commitments from C.P. Rail that remedial seeding will be conducted to achieve the minimum required cover, existing conditions strongly suggest that subsequent seeding attempts will be very difficult. Machine access to the slopes may not be possible after construction has been completed, and Mr. Polster has outlined that scarification may be very necessary to prepare a seed bed. Soil exposed to rain and run-off results in severe breakdown of structure of the soils due to the beating action of rain and the assorting action of flowing water. The result is the formation of a relatively impervious seal on the soil surface which reduces the rate of water infiltration into the soil, increases the volume of overland flow, and exposes existing vegetation to water stress. Surface sealing of the soil eliminates the microsites which catch seed and fertilizer pellets.

The C. P. Rail reclamation plan places considerable reliance on a program of repeated seeding attempts in order to achieve adequate plant establishment. The application of a mulch is suggested in order to reduce erosion,

(Walker)

maintain infiltration rates and provide additional microsites for seeding establishment. For example, a couple of indigenous materials which should be rather cheap is wood chips from clearing operations and slash, which I would define as the smaller brush, small trees, 5 to 15 centimeters in diameter, limbed and layed on the ground close to the soil surface. The use of this material is strongly over, for example, straw in order to avoid introducing weed seeds into the Park.

Tree/Shrub Transplants, and this is Phase 2 of the reclamation plan.

The reclamation plan calls for the planting of woody species in spring within one year of seeding operations. A cover of seeded species is the only method of erosion control and complete establishment of the herbaceous cover may require as long as two full growing seasons. Attempting the final reclamation step before the method of erosion control has proven successful, suggests a high risk of failure. While a commitment to replanting has been made, the "desired stocking rate" has not been defined.

I have a number of Miscellaneous Comments to make. The C. P. Rail submission contains information on revegetation not previously mentioned in the Norecol Plan, and the following are my comments:

(Walker)

Asphalt tackifier has been mentioned. Asphalt is a light petroleum oil. It is proposed to be hydroseeded on sections with exposed rock. I feel spraying oil on rock faces is not an appropriate method of mitigating visual impact. The use of asphalt tackifiers has been banned in at least four states in the U.S., because of adverse environmental effects.

Use of Straw:

Straw mulch and straw bales have been suggested for use in controlling sheet and channel erosion. While straw can be an excellent material for erosion control, the introduction of weed seeds borne in the bales is almost impossible to control. The use of straw within Glacier Park is most inadvisable.

Reclamation Monitoring:

The monitoring program outlined by C. P. Rail calls for the reclamation inspector to be on site two weeks per month until field personnel know the proper procedures. In the view of the complexity of construction and coordination of activities required, part-time supervision does not appear adequate. Will the C. P. Rail construction inspectors be on site only part-time and then only until the construction contractor understands the procedure?

(Walker)

I would like now to make some suggestions for reclamation standards that could be adopted by C. P. Rail and Parks Canada in the form of an agreement. The adoption of reclamation standards by the principles involved could provide a clear understanding of expected results and ensure a harmonious working relationship over the course of the construction period and beyond.

Reclamation standards are commonplace for construction projects under provincial jurisdiction particularly in British Columbia and Alberta. Reclamation procedures and expectations are documented in several publications prepared by the governments of British Columbia and Alberta.

Reclamation standards would be of benefit to both C. P. Rail and Parks Canada. Revegetation of drastically disturbed lands is a relatively recent development and lacks a long history of experience that could reduce differences of professional opinion, and I guess it must be clear by now that there are differences of professional opinion here, and despite these I would like to add that Mr. Polster and I are still talking. The adoption of standards would allow C. P. to select their method for achieving the agreed-upon results. A reclamation bond is commonplace for most large projects under provincial jurisdiction and is also suggested in this case.

(Walker)

The following points outline reclamation standards which could be applied to various aspects relating to reclamation. Most of the parameters have been taken from the C. P. Rail submission or the Norecol Reclamation Plan.

D-1

(Walker)

The herbaceous cover of grass and legumes provides several functions: first, erosion control; visual impact mitigation; and the development of a self-sustaining soil profile. Therefore, two parameters are proposed. The first parameter: a plant density frequency. A minimum plant density of ten plants per square foot one year after initial seeding has been suggested by C.P. Rail as a criteria for remedial seeding.

My suggestion for a proposed standard for plant density is one plant per square foot, averaged within any area ten metres by ten metres, and occurring with a minimum frequency of 90 percent. Native invading plants should be included in this measure. The area of canopy cover of invading or transplanted woody stock should be excluded and areas of bedrock, blasted rock and shallow soil over bedrock should naturally be excluded.

A vegetative ground cover has been identified by C.P. Rail as the best and primary method of erosion control. As such, the vegetative ground cover criteria is of importance in providing adequate amount of erosion control. An intensive amount of research on the effects of associated mulch and vegetative canopy cover indicates a combined cover of over 90 percent can be 99 percent effective in controlling erosion. Erosion control drops quickly when canopy cover is below 70 percent. Therefore, the

D-2

(Walker)

proposed standard for vegetative canopy cover is is an average of 80 percent canopy cover, including detritus, this is dead plant material from a previous year's growth, within any area ten metres by ten metres.

The establishment of self-sustaining vegetative. Vegetation much be capable of maintaining adequate cover and density without the aid of applied fertilizers well beyond the time when residual effects have ceased. The proposed standard for measuring self-sufficiency of vegetative cover is measurements of plant density and canopy cover should be made on areas not fertilized for a period of three years.

Stocking density of woody species. The reclamation plan calls for transplanting densities of 2400 to 4500 stems per acre. The proposed stocking density of woody species including the invading native species is an average of 1200 plants or stems or living trees per acre growing at not less than a 20 percent rate of adjacent similar natives. This standard applies to all areas originally transplanted.

The erosion control standard. Acceptable levels of soil tolerance are dependent upon several factors. Soil eroded off site into dense vegetation during a three to five year construction period is considered to be an unavoidable environmental risk. Plants on the forest floor will be buried and low-

D3

(Walker)

lying areas may experience accumulations of sediment. But the overall effect to the forest will be minimal. Sedimentation of aquatic habitats is best monitored by sampling. Water sampling is beyond the scope of this review.

Soil loss tolerance for a reclaimed area depends on balancing soil formation by weathering and accumulations of organic matter with erosion losses. Current soil conversation practice accepts soil loss tolerances in the range of two to ten tons per hectare per year, depending on the rate of weathering and the climatic conditions.

The objective of a self-sustaining vegetative cover requires that organic matter accumulates as rapidly as possible. The proposed standard for erosion control is not more than 100 tons per hectare per year. This provides a good margin of air and for a cushion, I believe the standard is low enough to protect Parks Canada interests and yet high enough to allow some variability on the reclaimed site.

Reclamation bonding. The posting of a reclamation bond is proposed of sufficient size that in the unlikely event of default, Parks Canada would be sufficiently refunded to reclaim the area themselves. Current costs of reclamation for drastically disturbed lands ranges from approximately $13,000 to $63,000 per hectare, depending on the

D4

(Walker)

quality required. These estimates include earth moving, but the quality required for a national park is high, therefore, the proposed reclamation bond is $20,000 per hectare. The area could be partitioned and certification granted to various sections when judged to be successfully reclaimed. Assessments should be made in three year intervals with a maximum ten year period after construction with which to reach the specified standards.

That is my submission, Mr. Chairman.

THE CHAIRMAN: Thank you very much. I guess we are going to have a number of questions now. Perhaps it might be convenient if C.P.'s consultants could come up and share the A table with you. You can share it with C.P. or since you are still talking to each other you can share the same one over here.

I will start off a question and this is concerning a presentation that was made yesterday. I take it implicitly from your presentation that you feel that given the 1.5 to 1 packed slopes in many areas that C.P. is proposing and the presentation by C.P. and the standards that you are proposing, that you feel it will be possible, albeit perhaps difficult to reclaim on those slopes and meet the standards that you are proposing.

DR. WALKER: Yes.

THE CHAIRMAN: My question then is to

D5

C.P. as to the standards. I believe in your presentation, Mr. Polster, you mentioned that you were perhaps not in general agreement, that is putting words in your mouth, but perhaps you could tell us if you agree or which of these standards you agree with or where you have some differences. That would be very helpful.

MR. POLSTER: I will just go right through them in the text as they occur in Mr. Walker's text.

Plant density frequency, I suggested a contract spec of ten plants per square foot one year after. Dr. Walker is suggesting one plant per square foot. It seems to me that what Dr. Walker is aiming at is one big vigorous plant, although I am sure that we are in accord there.

DR. WALKER: I was referring to release of a reclamation bond, so that would be several years down the line, whereas you are referring to establishment one year after.

THE CHAIRMAN: The difference is in here as between how you start off and how you end up.

DR. WALKER: Exactly, but you can expect a number of plants to die off.

DR. ROSS: That is something I wonder if I could ask some more information about. It is not clear to me what the survival rate is after

D6

the first year. Is it quite high or do I understand that you are implying that the survival rate after the first year will not be very high and the difference of three years down the line and one year down the line are likely to be quite different?

DR. WALKER: They are likely to be very different and that is because large, vigorously growing plants require a certain area, a certain soil volume to exist and this seeding rate is much higher than that density, so you anticipate a considerable amount of die off.

It would appear from the C.P. plan that they are aiming at a very high initial establishment to act as an erosion control measure and are therefore expecting a very high die off rate, and this occurs by plants completing against one another.

DR. ROSS: That is not a problem at all. That is the normal evolution of this sort of a ---

DR. WALKER: It is certainly very normal but I would not say it is desirable because what happens is the more vigorous or competitive plants under the existing conditions which may at that time be under fertilization conditions are the ones that end up surviving and species that, for instance, would be more competitive under lower fertility conditions, for example the legumes, would end up getting crowded out.

D7

DR. ROSS: So you are suggesting that it may in fact be wiser to seed at a lower rate and perhaps with some different species?

DR. WALKER: If you did that then additional erosion control measures would be necessary to make up the difference.

MR. POLSTER: If I might just interject here. I have been involved in reclamation for a fair number of years and have looked through the literature at seeding rates especially on steep slopes, and I will agree, the rates that I am suggesting are high, you know, especially compared to an agricultural situation, but they are not outside of the limits which have been reported in the literature or are suggested by various documents from governments, various levels of government.

THE CHAIRMAN: Could I just ask a question of time in this one. Presumably if there was a bond there would be some pressure to get this plan happily established in its square foot, but is it reasonable to expect by the end of this construction project that the standards will have been met? In other words, could we see to this reclamation as being achieved by that time or are we thinking of this thing dragging on into the next decade?

MR. POLSTER: I think that time is a critical thing with reclamation, particularly the establishment of the initial cover as that is our

D8

proposed means of controlling surface erosion.

As you are probably -- well, you may be aware, all of the plants that I am proposing for use in the initial cover are perennials, which means that the first year of growth is relative low key and the second year they start to really go to town and produce seed and that sort of thing. So that you get some establishment and some control of erosion in the first year and the second year it is covered. So that for the initial cover you could expect to be able to assess your results, say, after the second year after it had been seeded -- well, two full growing seasons, let us put it that way.

So if you seeded in the late fall, with the spring emergence, then you would go another full growing season after that.

With the shrubs, you would want to probably wait three or four years before you had determined that they were permanently established and that things were going as planned.

THE CHAIRMAN: I believe Mr. Fox is going to be chipping away at his tunnel for some time after the surfaceway has been done, a number of years, so presumably by close to the end of the construction project you would have an idea whether this thing was going to be established and meet the standards?

MR. POLSTER: Yes, I think for part of

D9

it you would, yes, but of course the surface route is going to be going as well and you are also going to be using part of the tunnel fill on that section between the short and the long tunnel.

So I would suggest that we look at standards a couple of years after the initial erosion controlling revegetation effort and maybe five years after the planting of woody species.

THE CHAIRMAN: If you want to go on through the standards, then, please.

DR. WALKER: Could I add something to that, Mr. Chairman?

You are missing one of the parameters and that is the creation of a self-sustaining plant cover, and in order to do that on a drastically disturbed site, you must replace the organic matter which is the pool of nutrients and in this case where topsoil is not or cannot be replaced, you are in essence growing your own topsoil by fertilizing grasses and each year that the roots and the stems die off and decompose, you are adding more organic matter.

This process is expected to take a number of years for this to build up and then there will be a period of no fertilization before you can determine whether it is in fact self-sustaining.

In my opinion we are looking at perhaps a five year period of good maintenance and then another three years at least of waiting to see how

D10

it is going to look. It could very well be a ten year period before the bond would be released.

THE CHAIRMAN: Do you want to continue through your standards?

MR. POLSTER: Okay. I agree that an 80 percent cover is a reasonable standard to expect for control of erosion and with the exception of rock slopes and those parameters you mentioned before, I agree with that.

I think that it is true that we cannot propose to access the success of the revegetation effort while we are continuing to supply nutrients and I might point out that as opposed to the approach that is taken by B.C. Coal, one of the operators in southeast B.C. who probably has the largest area under reclamation right now in which repeated applications of fertilizer of some 200 pounds per acre are used every year, we are going to be taking the approach that Fording Coal has taken and the Cominco research group has developed.

Getting legumes established is an important part of the reclamation program so that we do not have to go into that heavy fertilizer program. I think that as Dr. Walker has pointed out, with an artificially maintained fertilizer program, what happens is you get survival of those plants that are best adapted to that program and not necessarily the plants that are best adapted to the environment.

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Now, I agree with Dr. Walker that it is critical that we get the organic matter build-up in the soil. You know, I differ in the approach.

Anyways, I think that measuring plant densities after three years of non-fertilization is reasonable.

I think the average number of stems per acre for woody species is reasonable, although on the low end of the range, suggested in the literature for erosion rates, I think that the rate of erosion is one which we can attain.

I think I will let Mr. Fox address the bonding issue.

MR. FOX: Do you want me to address it?

THE CHAIRMAN: Sure.

MR. FOX: Well, I am not sure that Dr. Walker is aware of rules and regulations and the laws that govern railways. Have you ever read the Railway Act, Dr. Walker?

DR. WALKER: No, sir, I have not.

MR. FOX: Well, in the Railway Act, they can just about tell the railway exactly what they can do, when they are going to do it, and how they are going to do it and make sure it is done. If you do not do it, you can end up in jail. It seems to me that is a lot better than a bond, particularly when you are talking to a multi-billion dollars corporation.

I would suggest to you, sir, bonding is

D12

quite a thing to do for small mining ceprators who make a hell of a mess and then go bankrupt. I agree with that 100 percent, but when you are dealing with the railway with the laws that govern us I disagree wholeheartedly.

DR. WALKER: Sir, I do not believe that the Alaska Highway Gas Pipeline or Syncrude could be considered a small project.

MR. FOX: But they do not have the Railway Act governing them.

THE CHAIRMAN: Maybe I could ask Mr. Tikkanen whether the Railway Act would apply in the degree of detail concerning something like re-establishment of vegetation cover.

MR. TIKKANEN: That is a very good question. We have not -- I cannot think of an instance where it has been an issue before the Commission. There are references in the Railway Act which deal more generally with terms like restoring the draining, the pipelines, this kind of thing to where they were before the railway began its work, but I think it is probably a lawyer's question at this stage.

However, I think on the basis of practical experience that I am aware of, the railways I think have shown the intent of restoration. I do not think there has been glaring examples of where they have not recognized that sort of responsibility in the past. However, as I

D13

say, it perhaps is a question for the lawyers of the Commission and the lawyers of the railway.

THE CHAIRMAN: Is there any possibility that you could get back to us with advice after you checked with your lawyers on that particular issue? If you have anything further to add I would appreciate an answer.

MR. TIKKANEN: I will check that out and let you know, yes, certainly.

THE CHAIRMAN: Thank you very much.

MR. FOX: Ken, before you go away, I think if you look at the Railway Act, there is one clause in there that covers everything, including the kitchen sink.

MR. TIKKANEN: 104?

MR. FOX: Yes. Well, they can make you do anything under that clause.

MR. TIKKANEN: It covers everything but in about three or four lines.

MR. FOX: That is right, it does not leave any loopholes either.

DR. ROSS: Mr. Fox, is that the section you read to us at the last hearing?

MR. FOX: I believe it is, yes.

MR. TIKKANEN: Well, I think my reference to the railway's intent, good intent is probably demonstrated by Mr. Fox's approach here but he recognizes that in that particular section of the Railway Act there are serious responsibilities

D14

on the part of the railways to conduct restoration.

THE CHAIRMAN: What would you do if there is a disagreement as to whether something is adequate restoration. Say, for example, Lake Louise, if Parks are not happy and C.P. are happy, how would you resolve that particular -- if there was a dispute. It is a hypothetical question.

MR. TIKKANEN: Well, the mechanism in the Commission for taking positions on these things is to issue orders, and the Railway Transport Committee would issue an order calling for whatever the works might be.

If the railway is not pleased with that order or feels that it is beyond the jurisdiction of the Commission, its mechanism is to take the disagreement to the Review Committee of the Commission. The Review Committee of the Commission renders its decision. If the railway still does not like that decision, it can go to the Federal Court.

THE CHAIRMAN: Presumably if we have got agreement on what the standards are. We can hardly go out and count plants and see they had been met.

DR. ROSS: But could I get back to the beginning of that. You said that the Commission would issue an order.

MR. TIKKANEN: Yes.

DR. ROSS: Now, how would the

D15

Commission decide whether or not that order is the appropriate solution. That is, if in this sort of a case Parks and C.P. were of a difference of opinion regarding the satisfactory reclamation, would CTC automatically issue that order to the railway and then have it appealed, or would CTC make a decision as to whether or not that order is appropriate?

MR. TIKKANEN: I think in this particular project, the order has already been issued. That was the decision of last March 9th or a year ago March 9th.

The decision basically states, I think, although it does not set out environmental standards or work standards, I think the order and the decision which is part of the order is quite specific in the sense that it requests that the railway work to a standard which is recognized by Parks Canada.

THE CHAIRMAN: Thank you very much, Mr. Tikkanen. It is very useful to have you here to answer those questions.

MR. FOX: Mr. Chairman, it is Section 103 and 104 of the Railway Act and it is contained in the order that was released concerning this particular Project.

THE CHAIRMAN: Thank you. The questions that follow along that is that the performance and the level of quality that is expected, if there is an agreement, basic agreement, on what is expected for satisfactory work, where does the responsibility lie from your point of view, Mr. Fox? Do you use contract help for the work of reclamation with your consultants advising as to whether the work is being properly done?

MR. FOX: That is correct.

THE CHAIRMAN: So that if it does not meet standards and if you have got these sort of standards written into the contract, you just go to the contractor and say you did not perform, or is it something where you have to pay them to do the work, and if they are not successful you have to pay them to come again?

MR. FOX: Well, you can do it two ways. You can take your approach which is one approach,and the other approach is as your are looking at something that is going to last over a number of years, from what I can understand from

these two experts here, would be in that vein. In all possibility I would ask for a performance bond that would extend over that period of time from the contractor and then you would get them where you want them.

THE CHAIRMAN: It would transfer the responsibility to the contractor.

MR. FOX: Well, he is the guy that is going to do the work and he is supposed to have that necessary expertise or he should not be in the game. So if he has got that expertise, he can get a bond.

DR. ROSS: Mr. Fox, was Mr. Pōlster speaking for C. P. Rail when he concurred with those standards?

MR. FOX: He certainly was, Doctor Ross.

DR. ROSS: Doctor Walker, these standards, are they sufficiently objective that anyone making those measurements would be expected to get the same sort of results or do they require some sort of interpretation of what is in the field? What I am thinking of is a matter of who should make the decision as to whether or not the standards have been met. In some cases, they would simply be a matter of putting a meter on top of plants and seeing if that is the red line, and if that is the case, then anyone could make the assessment, but in other cases, if it requires some interpretation

of what is there perhaps one should use an independent assessor to make those determinations.

DR. WALKER: I would recommend an independent assessor. Much of the error that could be introduced with these measurements comes from the choice of location, and so some independent method of statistically sampling the area would be warranted. Certainly the actual measurement methods themselves are well documented methods in practice in plant ecology.

MR. TENCH: Doctor Walker, I am still having trouble on this erosion figuring here. It seems that soil loss tolerance of 2 to 10 tons per hectare per year is the going rate and yet we can leep right to a 100. I know you discussed this before but I could not see the relationship of those two figures.

DR. WALKER: Well, naturally it would be to C. P.'s advantage to get their soil loss tolerance to keep their soil losses below the acceptable soil loss tolerance of for example of ten tons per hectare. So I am not particularly concerned about that because if they are creating self-sustaining plant cover, they will have to meet that. So I added a factor of 10 to give them some leeway but also to set a level that would give Parks Canada some protection for continued erosion off the right-of-way onto their property.

I am also anticipating that C. P. will have a much higher soil loss tolerance because during those early periods they will be attempting to accumulate organic matter and will be fertilizing and will be very likely to be accumulating soil at a much higher rate than the normal weathering pattern.

THE CHAIRMAN: If I could follow up on that -- presumably your line of thinking then would be to have an independent expert again measuring with a rill meter or whatever what the soil loss is, but then my second part of my question is if you find yourself with a standard, what do you do, and maybe I could ask you and then ask C. P. to respond to that.

The first one is presumably you want an independent expert to measure the soil loss?

DR. WALKER: Yes, although I am sure C. P. would also want and have indicated they will be doing their measurements and will have a fairly good idea of what is going on, but I would suspect if the issue is over the release of a reclamation bond that an independent assessment would be necessary.

THE CHAIRMAN: I think I am more concerned about the beginning where problems might occur, getting the plants established, and if somebody felt that there was a lot of

erosion taking place -- how do you deal with that particular problem, and for the worse case where you lose a whole portion of the bank, and I have seen many examples of these along the highway?

DR. WALKER: I realize that by simply letting C. P. conduct their reclamation program in their own manner and then setting a reclamation standard that leaves a hole in that case -- it leaves a hole like there is no control during that construction period or the early periods as to the rate of erosion, et cetera, but as I stated if there are slumps or periods of serious erosion where sediments and soil material is transported into the trees, I do not anticipate any long term adverse environmental effects.

If that soil is deposited into a water course, then I would anticipate the water quality standards that Doctor Adam mentioned yesterday would be in effect and that reclamation work would be prompted on those standards.

THE CHAIRMAN: How difficult is it going to be to get some material back on that slope again and maybe this is --

DR. WALKER: It is going to be exceedingly difficult and I would assume that if these standards are agreed to that C. P. would be making every effort to keep the slope, this soil on the slope and get a good catch the first time.

THE CHAIRMAN: I do not know whether you want to respond to that C. P., but one additional point I would like to know is that if you do get an event where you lose part of the bank, are you going to end up in an argument between the contractors - one that says it is pretty hard for me to reclaim this thing when it has disappeared on me down the hill.

MR. POLSTER: I just should point out that there are two different things we are talking about here. One is controlled surface erosion and the other is the control of geotechnical stability, and I suggest that if you are talking about banks sliding away you talk to the geotechnical experts.

With control of surface erosion what I would suggest for the standard is that the 100 tons per hectare per year be adopted as a standard averaged over two yeras, because -- so that that standard would be applicable to any one year, but that obviously if you had a 125 tons the first year and you were down to 12.5 the second, then because of the time required to get vegetation established, that is what I would suggest. That it be averaged over a two-year period to allow for the establishment of vegetation. Now obviously we are going to be concerned about -- you know, if we find that the rates are high, we are going to be concerned about the downstream effects and that

sort of thing. We are also going to be concerned about how well we are going to do the next year. So we will be going in with measures to control that, and we will be testing some of those measures this summer - application of soil binding sprays that sort of thing. So that is what I would suggest for the standard there.

MR. TENCH: Doctor Walker, on page 6 of your Report, you mention that there are several other examples of reclamation in similar mountaineous areas. I presume of this magnitude and type. Would you like to give us a short talk on some of them and the rate of success they have achieved and the length of time that they have taken to revegetate and reclaim.

DR. WALKER: Well, the area that is most similar and that I know best is the Lake Louise area, which I have acted as a consultant for four years and as a research graduate student for three years previous to that, and I found that the dependency on fertilizer has been rather site specific, and I suspect dependent largely on species composition that I have managed to get established; a number of other factors like moisture availability, et cetera, but it is generally found that three years is necessary to maintain to the initial cover and, of course, now the time constraint is coming in and I cannot tell you. After that there are some sites which

appear to be requiring fertilizer every two years, every three years, and others that are requiring fertilizer twice a year. As I say the research has not been going on long enough to know exactly what the length required is and what kind of soil parameters could be measured easily to determine whether it is self-sustaining.

The B. C. Coal experience has shown that while very large pools of organic matter can be built up, is it necessarily sufficient? It depends also then on the breakdown of this organic matter, and the plants that you use to get them build up that organic matter may not be the most ideal plants for growing under those conditions. So you are then faced with a species change requirement.

MR. POLSTER: I would like just to comment on a few things. First of all, the Lake Louise situation is not comparable to the Rogers Pass situation. The Lake Louise situation is probably more comparable to the B. C. Coal situation where you are dealing with elevations on that order of magnitude and climatic conditions on the top of Harmer Ridge on that order of magnitude.

The other thing is that in talking about the B. C. Coal situation, I think it is important to point out the extent of the reclaimed area and the effort to which B. C. Coal has gone to in reclaiming their areas in terms of nutrient cycling.

I might add that B. C. Coal is the largest operator in B.C., coal mining operator, and they have some 6,000 hectares under disturbance of which they probably have about 2,500 under reclamation, and what happens when you get those large areas disturbed and under reclamation that you have no chance of getting natural soil organisms from adjacent sites onto the site, and it has been found that the soil micro-organisms ,nemitodes and bacteria and all sorts of other things, play a large role in the nutrient cycling. On the other hand, if you look at exploration disturbances, which are more on the order of what we are talking about where trenches have been dug and that sort of thing, you find that the natural cycling of nutrients re-establishes quite quickly and there is very few exploration disturbances which are re-fertilized every year on the B. C. Coal property. It is their large areas that require repeat applications.

DR. WALKER: I would have to disagree with the statement about the large area and, therefore, the invasion of the micro-organisms is a factor. Studies by Doctor Parkinson of the University of Calgary for example have found that invasion of bacteria is very, very rapid. I think the situation is similar by important factors, such as the steepness of slope, the alkalinity of the soil for example, the aspect, the lack of organic matter for example, but let us not get into this kind of a

discussion. It does not seem to be productive. I know experts can talk weeks on this very topic about nutritional exchange. I believe that you will have to watch the area very carefully to achieve a self-sustaining cover and you should be ready to keep the maintenance up for quite some time.

MR. FOX: I wonder if I could just ask a question. How exact is this science? We have got two professionals here who are talking to us and they sure as hell cannot agree. How exact is this science?

DR. WALKER: It is as exact as engineering I imagine.

MR. FOX: I doubt it very much. You cannot sure as hell put a mathematical equation to it. Having said that, you know I am just an old farm boy -- I was brought up on a farm, and it seems to me if you put your mind to it, you can do a lot of things, and one thing you can sure put your mind to is to grow something, and that is really what it boils down to in the final analysis. We have been farming in this world for a long, long time and we have been feeding everybody. There is not too much difference in that.

DR. WALKER: I have to agree with you, sir. If you put your mind to it, I do believe you can grow things.

MR. FOX: Well, that is what I am

going to do is put my mind to it. I can assure you and I have been saying that now for two years.

THE CHAIRMAN: I have got one question concerning the use of mulch. I believe you mentioned chopping up trees and using the particles from that. I am wondering how that relates to the problems we heard about the bark beetle. We heard that good sanitation was being proposed in order to avoid these problems. This came up in Golden, I believe. Does anybody know whether this mulch, chopped up pieces of trees, would be a home for these bark beetles and, therefore, risk introducing an infestation.

MR. POLSTER: On that wood chip deal that was tested at B. C. Coal and has been used what they found that was they needed to apply such large rates of nitrogen fertilizer to assist the break down of the cellulose in the wood that it pretty well was a lost situation. I do not believe they are doing very much wood chip mulching anymore. They did it at one point.

DR. WALKER: It depends greatly on the rate of application as I am sure you are aware.

MR. FOX: I would like to ask a more practical question -- what happens in case of a fire on good dry periods of time?

DR. WALKER: Again I am not suggesting that such high rates are required to achieve the desired results.

MR. FOX: Well, if you spread wood chips around I can assure you that there are going to be lumps of them here and there and if you get a fire started up a side hill like that on a windy day when it is good and dry, it is goodbye forests and National Parks.

DR. WALKER: A proper method of application includes working this into the ground somehow or fixing it in. Again, I must say that low rates would not be a fire hazard and particularly in the Rogers Pass area. This method has been used in Alberta in forestry and their conditions are much dryer than the Rogers Pass.

THE CHAIRMAN: You do not know whether it would be a home for the beetles though?

DR. WALKER: I believe the beetle problem is at present theoretical but erosion is not at the present. So my choice would be to use that.

THE CHAIRMAN: I guess we probably haveto talk to our forester about this--if we ever got into that degree of detail, but it seems to be a point that might be worth checking out given that we were given this warning of this beetle that is just up the valley.

MR. POLSTER: If I might just comment, I think the application of mulch is designed to control erosion and that really if

we fall back on our erosion standard that it does not really matter whether we use Deci 162 or we use an application of wood chips or we use cellulose fibre mulch and a hydroseeder, or whatever method we use.

THE CHAIRMAN: I would not have been overly concerned except I heard something about a problem yesterday and I had a professional giving me some advice and I think it is always, when I hear that sort of thing, worth checking out before you proceed ahead and do so -- get some more advice, and it seems only sensible.

MR. TENCH: There has been some discussion about spraying rock faces with asphaltic compounds. Could we have a discussion between the two experts on that to see if we can arrive at some decision on this at the Panel-end of the proceedings. Apart from the fact that spraying asphalt of rock faces is a good fire hazard as well, I do not know what the wood chips would be.

DR. ROSS: Could I in particular ask Doctor Walker to elaborate on what the adverse effects of that spray are?

DR. WALKER: Well, for one thing when they studied its effect on plant emergence they found that the asphalt decreases plant establishment. It is true asphalt can at certain concentrations be effective in controlling erosion

and if erosion is the limiting factor for plant establishment then you will see improvement. Where it is not, then you will see a decrease in plant establishment. The stain, I believe, is a visual stain that will remain for quite some time. It is a problem or has been a problem in some cases with dogs, kids, people, getting covered in the material.

MR.POLSTER: Mr. Chairman, the suggestion for use of asphalt emulsion on the rock cuts was solely to reduce the glaring visual impact of light coloured rock cuts during the first few years of the operation. It was not intended as a long-term thing, but just to minimize those rock cuts as we are getting the rest of the reclamation program going.

As Parks suggested that we minimize the visual impact that was one suggestion that we had for minimizing it. I am sure C. P. would be happy not to apply that asphalt tackifier if it was deemed inappropriate for the situation. It just costs money.

DR. WALKER: The money would be far better spent on long-term reclamation.

THE CHAIRMAN: Parks do you have any comment on the application of that material?

DOCTOR LEESON: Well, we would have to see some of it. We do not really know what you are talking about. I saw it up at Abraham Lake five or six years ago but I do not know

if -- along the David Thompson -- is that the kind of thing you are talking about?

DOCTOR WALKER: That is what I am talking about and they have tried to revegetate the David Thompson three years now using asphalt and it has been unsuccessful every time.

DR. LEESON: If that is exactly what is being talked about, it is a pretty unpleasant looking material.

THE CHAIRMAN: Any further questions?

MR. POLSTER: I would just comment that we are not using it as any part of the revegetation program. It is not a point in terms of revegetation. It is solely for visual impact amelioration where the landscape architect has drawn on his experience and found that it has been successful.

MR. MacGREGOR: Except that the negative visual effects that you perceive are for close-up, where you have to remember that we will be looking at this from about half a mile away. It is purely to keep down the glare of the light beige colour as it contrasts against the deep green of the coniferous trees, and, of course, we will not be growing vegetation on those rock faces. So we know that it will not have an effect on the vegetation.

THE CHAIRMAN: Okay, that is what I would like to clarify: you are only intending

to put it on the rock faces?

MR. MacGREGOR: That is right.

THE CHAIRMAN: So your markings on the visual impact analysis have given me the impression that it was going to be put everywhere, but what you are saying is only on the rock faces?

MR. POLSTER: Only on the rock faces and only because we got into that situation at the entrance to the Park where we were squeezed in between the river and the existing line, where, of course, we were in rock.

THE CHAIRMAN: So you would be relying on the establishment of your vegetation to reduce that glare of the soil material.

MR. POLSTER: That is right. As we mentioned, it is a one-shot effort and once the vegetation has re-established, we do not feel it will be necessary.

THE CHAIRMAN: Thank you. Are there any other questions, Panel?

DR. ROSS: Doctor Walker, did I understand from your presentation that you were suggesting an increased use of topping materials or an increased use of top soils specifically?

DR. WALKER: An increased use of top soil specifically and a decrease based on, and I understand that there will be inspection of the top dressing material that is excavated, a decrease in the top dressing of that material, if it is not

better than what is already there. It seems that top dressing has become a means of disposal.

DR. ROSS: The next point is the question of time of seeding. I understand, with perhaps some flexibility too, you suggested no seeding after August 1st. Would that, in effect, shorten the construction period? That is, do I understand you or perhaps I am putting together some of the suggestions that you and Mr. MacDonald mentioned yesterday, would combine to shorten the construction period in the sense that slopes needing revegetation for erosion control would then be precluded from coming into being later in the season, effectively after August 1st. Is that a reasonable interpretation?

DR. WALKER: No, it would not. There would not be those constraints. I guess by way of explanation, I should provide a little more information. I work with the universal soil loss equation or a modification of it, and I did some calculations with data similar or we will call it similar to the Rogers Pass area, because not enough information was available, and what I found was that the rainfall factor for that area for the summertime is very low. I was very surprised my first calculation was 4.6. So I re-did it in another method and it came out to 2.7.

For example, rainfall factors in the mid-western States may be 100, and in the

Mississippi they may be as high as 500. I guess what that is saying is that it has a numerical description of it -- it just drizzles a lot in Rogers Pass. The maximum 24-hour rain is quite low. So what that means is that erosion during summer construction period is not expected to be high based on the rainfall factor, and, of course, during winter when there is no running water, it is also very low. It is during the spring run-off period that it is very, very high and as much as 90 per cent of the erosion during the year will occur during the spring run-off period.

In fact, when I calculated a run-off or a rainfall factor based on the snow pack and the melt of the run-off, it was quite high, and a factor of about 60. So you are not going to stop construction in August because you cannot revegetate it, because it does not make any difference. It still has to go through the run-off period. The August 1st cut-off was simply to aid plant establishment and that the seedlings that get started after August 1st simply are not large enough generally speaking to go through the winter period and still survive at a high percentage?

MR. POLSTER: Would you like a comment from this side of the Panel?

DR. ROSS: Oh, yes, surely.

MR. POLSTER: I showed in my presentation the effects of fall seeding, fall applicat[ion]

of seed on very steep slopes, and I do not know that -- well, I probably did not mention it, but one of the things that we were testing there was the fall seeding. The idea in that is not that you get germination that year but get germination the following spring. One of the things we learned from that obviously -- well, that it is an effective means of getting grass cover established as early as possible ---

DR. ROSS: Excuse me, I missed a negative in there. Did you say it is effective or it is ineffective?

MR. POLSTER: It is effective at getting a grass cover. However, because of the biology of legume seed, and you know we could go into that for hours, the legumes do not seem to over-winter very well. I thought they probably would because of the heavy snow cover, but this is a common experience in reclamation. So we may find that with fall, late fall seeding, and that was seeded in October just before the first snowfall, well, during the first snowfall, that with that late fall seeding we can get grass established and we have to come in and redo the legumes.

DR. WALKER: Are you saying that you did not get any legume establishment from the last fall seeding?

MR. POLSTER: There was very little.

DR. WALKER: I thought those photographs argued for my point, so maybe I should elaborate a bit. In addition to the rainfall factor, there is a soil erosivity factor and a slope steepness factor which we have certainly talked a lot about, but there is also a length of slope factor in there which is almost as important as the steepest of the slope and the pictures that Dave showed certainly indicated a good stand, but I should point out that they were, in most cases, indicated short slopes. The east portal had a concrete wall just above it, so that there is not a large length of slope in that case, and even the cut bank or even the fill slope that was photographed, you were looking at the top of the slope and the length of the slope is not particularly long in that case.

When you add in slope lengths of 240 feet at angles of 60 per cent, the probability of erosion becomes very, very high, and my first suggestion for mitigation of this problem is to partition the slope by breaking it up into short segments, putting erosion berms across slope, which drain into vertical waterways, and try and break up the abnormal and very long slopes to try and mitigate that action.

MR. POLSTER: I might point out that we do not expect to have 260 foot slopes bare at any one time. Because the construction is

going to go over a couple of years, and we will be conducting reclamation as a sequential thing each year, we do not expect to have the entire slope for any particular cut bare at any one time, on long cuts and fills, you know, large volumes of material are being moved.

THE CHAIRMAN: Maybe we can move along at this point to any other questions in different areas that people might have.

DR. ROSS: I am reluctant -- I have one more question for Doctor Walker, and I did not want Mr. Polster to feel unwanted. I have several questions for him later on.

Finally for Doctor Walker, did I understand you to suggest that you would recommend delaying the introduction of woody species for two or three years until the herbaceous cover was fully established?

DR. WALKER: Yes, I would, because -- again though that is a suggestion that it is more benefit to C.P. Rail than it is perhaps to Parks Canada, if the reclamation standards are adopted, and that is because C. P. Rail may be in the position of having to go back onto a slope to reseed it and thereby destroying perhaps a considerable number of well established wooden plants just because some areas have not been revegetated.

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MR. POLSTER: I might just comment on the woody plants. In order to avoid competition which was suggested in the first review of the reclamation plan, the excess competition by trying to establish woody plants in a dense grass legume stand is well documented. We were trying to avoid that problem by establishing almost immediately so that as the grass legume stem grows up so does the woody plant and you minimize your losses from rodents and stuff.

DR. WALKER: I think you will find it also well documented that even that is not a very good method of doing it.

THE CHAIRMAN: I believe we are going to switch across to a question on visual impact assessment now.

DR. ROSS: First of all, I guess, Mr. MacGregor, I was looking at your work, both your presentation today and the document. It seemed to me that there were a great many very valuable contributions from the visual impact assessment work, but I was puzzled by your treating either superficially or not at all three issues which I thought would have had a significant impact on the aesthetics of the area, one of which is the width of the right-of-way, the second of which is the bridges, and the third of which I guess is now no longer relevant, that was the electric power transmission line.

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It seems to me that the width of clearing especially seemed not to be treated as thoroughly as I would have thought, especially in the one area where there is the siding. It seems to me that the very presence of that siding which is both in a very visual area and on top of some landslide areas was a peculiar place to put that siding.

I guess to Mr. Fox, is there any alternative siting for that siding?

MR. FOX: None whatsoever. We looked that land over and over and over again and that is the only logical place to put that siding, not only from the point of view of construction but from the point of view of operations.

DR. ROSS: What about west of Connaught Creek, between there and the east portal?

MR. FOX: You have not got enough room. That siding is almost two miles long. You have got less than a mile in there.

DR. ROSS: The issue of bridges, I guess I was looking for some sort of a feeling for the visual impact of the most visible bridges. I guess the Stoney Creek one is -- I think that is the longer one with the ---

MR. FOX: The 700 footer, yes.

DR. ROSS: And perhaps also the trestle as well, although I gather that the trestle may in fact not be visible.

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MR. FOX: You will never see the trestle from the highway.

DR. ROSS: That is fair enough. Did you deal with the aesthetic quality of the bridges at all? Were any changes made there, any discussion of that?

MR. MacGREGOR: Well, the actual design of the trestle has not been determined at this point, but as we said in a document, for the most, that is a 25 to 30 foot structure contained by 75 to 80 foot trees, so under those conditions. As well, the use of bridge structures, especially at Stoney Creek, have been used to really improve the visual quality as compared to using fills, and at that point we feel the bridge structure is a very positive visual addition.

DR. ROSS: That leads directly to my next question in which I have a quote from your report, essentially referring to the trestle structure which indicates:

> "What would have been by far the largest scar along the whole surface route has been turned through that structure to a little more than a subtle band across the forest."

The obvious question persists why not use that technique more frequently?

MR. MacGREGOR: Cost.

MR. TENCH: Could we have some idea of

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the relevant costs, Mr. Fox, between running the trestle and, say, an average cut and fill section?

MR. FOX: The cut and fill section, they average about half the cost of a bridge structure, and you are looking at something in the order of $8,000 a foot for a structure.

THE CHAIRMAN: Just a question on cost. What is the total cost estimated to be on this reclamation exercise? Has anybody sat down to figure that out yet?

MR. FOX: Yes, I have it. Privileged information.

No, I will tell you what I have allowed in the estimate. I put in $2 million to look after the revegetation.

THE CHAIRMAN: Thank you. You had a question you wanted to ask, Mr. Fox.

MR. FOX: Well, it was more of a comment to help complete Mr. Walker's education on railways.

You were mentioning on page 10, I believe, under reclamation monitoring you had some concerns about C.P. Rail inspectors be on site only part time. Allow me to correct you. C.P. Rail inspectors are on site at all times when construction is being carried out.

Now, I think what you perhaps were referring to were the reclamation inspectors, I would think. When you are talking C.P. Rail inspectors

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for construction, they are on site at all times.

I do not think I have anything else. I asked a question about fire and I talked about the others.

Anyway, I would like to say this, Mr. Walker. I am impressed with your document, and as far as I am concerned, I would like to thank you for all your comments. I found them very helpful, even though I still do not think you are right up there scratch with engineering.

THE CHAIRMAN: The intent was not to close the discussion off necessarily.

MR. TENCH: Especially with a scathing remark.

THE CHAIRMAN: We are not going to let you get the last comment. Bill Ross has got another question. George Tench, you have been neglected.

MR. TENCH: I have been looking at that old right-of-way now for 12 months and looking at it from the highway it ---

MR. FOX: Which old right-of-way are you talking about?

MR. TENCH: The original railway.

MR. FOX: Okay.

MR. TENCH: It obviously created less havoc to the landscape than the present one seems to be doing. It seems in many cases to be on the same profile of mountain as the present one and I have a suspicion that the techniques they used to move

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dirt with in the old days caused them to be a devil of a sight more careful with their engineering than we seem to be at the present time when we can go in there and really push it about.

MR. FOX: My turn?

MR. TENCH: Yes.

MR. FOX: Okay, that railway was built in, well, the early part of the 1880s, and while I do not have the specs of what they built it to, I would suggest that when it was built it was built through an extremely narrow sub-grade top, because in those days the type of power that is used or locomotive power in cars were very small and very light.

Today we are operating cars that weigh 131.5 tons on four axles. We have locomotives of a 300,000 horsepower range that have weights approaching 400,000 pounds on the trains that are going through that particular country today; we are operating in excess of 100 cars behind locomotives. Those are the big bulk trains we have, the mid-train power, and if we operated those trains today on that type of railroad, I would suggest, Mr. Tench, you might make one trip but you sure as hell would not make the second one.

MR. TENCH: I am not quite sure I get the picture. Are you hauling that stuff over that old bed now?

MR. FOX: That old bed in the last 100

years has been improved so much that you would never recognize it from the original construction.

MR. TENCH: That is an interesting statement because you have been in there quietly cutting and chopping at that old bed, and the slopes up and down from it and it still is a pretty sweet sight compared to two things, I must admit, the new highway and the new railroad.

MR. FOX: Another thing, too, if you are just talking the existing railway line, not the one that has been abandoned, now, my reference was made to the abandoned one, okay.

The existing railway is for the most part on a bench. If you go up there and take a good close look at it, it is located on a small bench and that eliminated the necessity to hoist very steep side slopes that we are now into. They do have a few down around Mountain Creek, but for the most part that is on a bit of a bench where the slopes come up and sort of flatten out a little bit and go up again. You know, they were not dumb in those days. They picked the easiest route.

DR. ROSS: You mean God did your cutting and filling for you.

MR. FOX: Now, you know, to give you a little further background on it so you can perhaps assess it, every railroad in this country was built initially to the standards of the power and cars that existed at the time they were built,

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and for the most part, they were built very cheaply, the cheapest method they could possibly find. No shallow fills and they would go around corners and this sort of stuff, and those lines today, over the length of time they have been in operation, they have been improved immensely. A lot of line relocations have taken place to take out the bad hooks that the original builders circumvented.

So any relationship to what we have today to what was originally there 100 years ago, I can assure you is purely coincidental.

MR. TENCH: The only thing that gets you off the hook is that blasted bench that was supplied by nature.

MR. FOX: That is right. Well, it happens to be there.

THE CHAIRMAN: Bill Ross, you have a further question.

DR. ROSS: One of the objectives for the visual assessment is, and I quote, "to maintain the present level of scenic quality by applying the appropriate mitigative measures".

Indeed, if that is the objective that you people intend to meet, and I think we would all agree and we would all be happy, what I think is clear by now is that most of us have some difficulty in believing that that is feasible within several decades.

I think it is probably reasonable to

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accept some deterioration and that certainly is a reasonable objective. What seems to give me some trouble is if I move to a different page and I indicate again from the Visual Impact Assessment Report, a description of the Mountain Creek bridge cuts which will be, and I quote, "supporting a healthy vegetative cover by 1983", then I start to have a mismatch. If I refer to Mr. Polster's quote which is, "successfully revegetated area", as I drove by, I must admit, I was unimpressed and I certainly would never have claimed that the revegetation on the Mountain Creek cuts maintain the present level of scenic quality.

So I think what clearly is the problem here is in part you may be setting standards for yourself which I do not think you reasonably intend to meet, maintaining the present level of scenic quality, at least in the short run, and therefore, setting expectations which are too high.

Do you think that you can maintain that level of quality? Do you really perceive that the Mountain Creek cuts are supporting a healthy vegetation cover now? I am in trouble. Would you respond to that?

MR. FOX: Which cuts are you referring to?

MR. TENCH: The existing one.

MR. FOX: What existing one, the gravel pit or up on the railway?

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DR. ROSS: I assumed that this was the bridge cuts.

MR. FOX: Mr. Polster was talking about the cuts on either side of the existing Mountain Creek bridge.

DR. ROSS: That is correct. I believe that is what I am talking about too.

MR. FOX: Well, be sure in your own mind because there is a gravel pit down below.

DR. ROSS: I am not talking about the gravel pit. I am talking about the bridge.

MR. POLSTER: As I pointed out in my presentation, obviously the existing Mountain Creek cuts are considerably more severe than even the most severe conditions that we expect on the new grade. Granted, we go through the same materials, but I will tell you that there was nothing done on those cuts to ameliorate the soil conditions or provide anything like suitable growth medium or anything like that. Also, they are very steep.

So, considering all that, I feel that our operational trials conducted last year were successful in establishing a vegetation cover considering the conditions of the slope.

Now, how long that cover will persist and whether we will have to maintain it with added fertilizer because of the lack of fine textured materials on that slope remain to be seen.

THE CHAIRMAN: Just so we have a

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standard on this thing, are you saying that what you have there, that you and Bill have been talking about does not meet the sort of standards that have been laid out in this particular ---

MR. POLSTER: No, I do not think it does. What we have there is fairly reasonable considering the conditions, but I would not agree to testing it by the standards from Mr. Walker because I do not think it would live up to the standards.

THE CHAIRMAN: Does Lake Louise meet these standards?

MR. POLSTER: No, but neither does the native vegetation around Lake Louise compare to the standards.

THE CHAIRMAN: I am not trying to be tricky in my questions. I am just trying to get an idea of how these standards might apply in something that I can relate to. To me right now they are just numbers.

But that is fine, I got the answer to my question. I think fairly soon we are going to have to break for lunch in order to give the Court Reporters a bit of a rest.

Perhaps what we could do is finish off this revegetation reclamation issue and then come back say at one o'clock in order to do the tunnel ventilation at that time, and after that we will have our closing statements which will be pretty close

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to the two o'clock that we are intending to have there. Bill Ross, do you have any further questions; George Tench? Any members of the audience who have any questions? C.P. has been providing some responses. Parks, do you have anything you want to say at this time?

DR. LEESON: We have got some things to say but it could be done in the final, if you want, but I could do it in about four minutes.

THE CHAIRMAN: Perhaps now might be the time to do it.

DR. LEESON: These are some short comments about the morning's proceedings. With regard to the visual analysis, we think that it was complicated and quite thorough, and while we may take some exception with the methodology and some of the assumed criteria, we do not disagree in the final analysis that Mr. MacGregor's work has changed the design and C.P. has responded to it in ways that will assist in reducing visual impact.

However, our bottom line is that we are less perspective than Mr. MacGregor regarding the appearance of the new line, the final appearance, that is. As I have said before, we think it is going to look bad, but we also do not know anything more that can be done to overcome the problem other than reclamation, and for that reason we are saying that reclamation is very important.

For the vent structure, we think that

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C.P. Rail has selected the best location and that they are planning to build a structure there that will be sympathetic to our visual concerns.

At this point we are concerned about the deteriorated condition of the access road and we would like to have that fixed up as soon as possible.

Now, with regards to reclamation, I am a little dismayed. After the proceedings of this morning, I do not know what we are going to do to look after ourselves. When two experts cannot agree on the whole thing what is going to happen to us. So, obviously we are going to need a lot of help and as time goes on when specific plans are proposed to be able to get them evaluated in a way that finally we know and C.P. Rail knows what we are going to get, so that we all agree what we are starting into.

We are simply going to need help, and again, I would like the Panel's consideration of that and what should be done.

Another point I would like to bring up regarding reclamation is that it is important to us that the scale of the reclamation undertaking is consistent with the scale and magnitude of the damage that created it. We would not like to see a situation where the countryside is torn apart with D-9s and then the reclamation people show up with garden tractors to try and fix it.

The rehabilitation standards discussion

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is very good and we would urge that specifications and terms of reference and monitoring criteria be established so that once the work is all finished that we and C.P. Rail know what it was we were supposed to get and we would be able to determine thoughtfully and intelligently what we got and respond to it if it is less than expected.

THE CHAIRMAN: Any further questions at this time? Mr. Walker, do you want to add anything; C.P.?

MR. FOX: No, not for me, Mr. Chairman.

THE CHAIRMAN: Okay, it is twelve o'clock now. If we could be back by one to discuss the noise acoustical evaluation and then we will proceed right on to closing statements. I think it is obvious we will not be meeting on Monday. I think we will have this meeting over this afternoon. Thank you very much.

---Luncheon Adjustment

---UPON RECOMMENCING AT 1:00 P.M.

THE CHAIRMAN: If we take our seats again, I think we are going to begin with a presentation from C. P. Rail's acoustical expert and then we have our own expert to make a presentation.

MR. SAM LEVY (Parsons, Brinckerhoff) Mr. Chairman, Members of the Panel, Ladies and Gentlemen: My name is Sam Levy and I am with Parsons Brinckerhoff working on the tunnel ventilation system.

I will first provide a brief summary of the tunnel ventilation system acoustical design study that we have conducted and then move on and just present some pertinent aspects with the aids of some transparencies, which are diversions from and in contrast with the high quality slides you have been accustomed to seeing here.

The tunnel ventilation system operation noise is one of the environmental concerns highlighted by the assessment panel's Preliminary Report of April, 1982. The primary goals of ventilation system noise evaluation and design are

1) To minimize the potential impact on the natural serenity of the surrounding area;

2) To achieve compatability with recreational use of the land by limiting noise impact areas to small localized zones,

(Levy)

And lastly,

To avert any identifiable potential impact on wildlife.

The project group took a detailed acoustical evaluation and submitted a report entitled "Rogers Pass Tunnel Ventilation System Acoustical Evaluation Design", Final Report, and was submitted in February, 1983. The Report has since been reviewed by Panel's acoustical consultant as to the acceptability of the design criteria and engineering feasibility of achieving the above goals.

The logical sequence of steps undertaken by the project to meet the stated goals are:

1) To first establish an engineering design noise criterian consisting with known and established standards and criteria related to public health and welfare, land-use compatability, annoyings in community, reaction of noise sensitive areas, environmental degradation, and effects on wildlife;

2) To estimate the resulting noise levels around the mid-tunnel ventilation building and the east portal fan building under the worse case vent system operation, based upon system engineering data;

3) To establish the need and degree of noise abatement measures to meet the design noise criteria, and lastly:

(Levy)

4) To develop the necessary engineering specifications and testing procedures to ensure the achievement of the stated goals.

The result of this test effort are: 1) we establish a noise criterian of 65 DBA maximum at 200 feet away from the vent structure. This is established both as environmentally sound and an engineering feasible design goal, the achievement of which will result in the noise environment compatible with the recreational and nature preserved land-use of adjacent areas, except for localized zones of at most 800-foot radius with no adverse impact on noise-sensitive areas such as the Summit Monument, the hotels, the Park compound, the campground and nearby trails, and would limit any potential noise impact on wildlife to these localized zones immediately adjacent to the ventilation structure.

This statement is affirmed by the Panel's Expert Review dated April 27, 1983.

2) The vent system operation noise levels in adjacent areas were estimated and superimposed on bagman noise levels for impact assessment to affirm the findings which were used to establish the design criteria,

3) Comparisons with design criteria were made and minimum silencing requirements to achieve the designed goals were established with a

(Levy)

margin of safety. In addition the engineering alternatives and feasibilities of achieving the goals were evaluated, as is affirmed by the Panel's Review Report, and lastly,

4) Detailed engineering specifications are being prepared to implement the noise control designs and procedures are under development to ensure the achievement of the design goals.

Now I would just like to move on to present some of the pertinent aspects to this effort. Now these are not high quality transparencies, and after all we cannot really visualize noise. Now prior to discussing the acoustical design aspects of the tunnel ventilation system, let us take a look at a setting of the mid-tunnel vent building and the east portal fan building with respect to noise impact concerns.

The diamond-shape, and I will point to it -- that is the one here, that shows where the mid tunnel vent building location and the start up here shows the east portal fan location. The major noise eminations of concern are the inlet and exhaust of the mid-tunnel building and the exhaust of the east portal fan.

The east portal fan exhaust is oriented to the east - that is north, and the exhaust on the east portal is heading to the east.

(Levy)

The mid-tunnel vent building exhaust is oriented to the north-east to the east up the slope and away from the Trans Canada highway, and its inlet is oriented to the south-west to the west, the opposite direction, down the slope and towards the highway.

As can be seen the area around the east portal fan is generally inaccessible to the public, and as far as noise sensitive receptors are concerned, the nearest hiking trails are about one and one-half miles to the east and the north. It is probably more than that.

The Summit Monument is about 2,800 feet north, north-west of the vent building -- I see other people have done surveys with the distances that are more accurate than mine and they are actually over 3,000 feet, and the other side of the Trans Canada highway, and the Park administration compound, the campground and the hotel accommodations at about 6,000 feet north, north-west. Again, the numbers I am using are low. The actual numbers are 7,000 feet. There is a nature trail about 3,000 feet to the west, which is this one. This trail is now maintained by Parks Canada, as pointed out by the Panel's review expert. All of these are on the west side of the Trans Canada highway, which is the main traffic corridor serving the Park.

Now the fact that the mid-tunnel vent building is located in the area by Park visitors and concentrated with points of interest, this

(Levy)

particular location deserves a closer examination in terms of potential noise impact.

Now I have a sketch which is another diversion downward from my transparencies, which shows very briefly -- this is just to show in general what the ambient noise environment is like. This is a one-inch to 200 scale. It is a working drawing, and as you can see there are numbers all over the place. This is the Trans Canada highway and that is the vent building and that is the monument. The hotels are out of the picture, much further up. What I really wanted to point out there were measurements taken by project staff and there were estimates made by the Panel expert, using some Canadian Mortgage Association data, on the ambient noise level, and generally when you are close to the highway, say 30 feet, about 66 DB, and when you move to 600 feet away from the highway, 50-53, and about 2,000 feet away, about 40. Now there are times the ambient will be lower than that during the height of the traffic activities. It is just to show a general picture.

We also have used a U. S. Federal FHWA, the Highway Administration Noise Prediction Model for Traffic drawn up to counters, and just to show that it is generally required well with the data, and that will give us a better picture of the ambient situation that is there, because there were

(Levy)

few points of measurement. We cannot really say very much. So these are just lines which show the 50 DB count to 55, and these are quite typical of the low level traffic highway.

Now around the east portal,although no measurements were taken, one can expect the noise level to be in the lower or mid-thirties, as typical of wilderness area than with the flow of Beaver River.

Now what do these noise levels mean? Perhaps the best way is to relate to some quantities of phenomenons that we daily encounter. Now this picture just presented some normal activities that we daily encounter and what their levels are in terms of DBA, which is a measure of closely co-response subjective human perception of loudness, and used most frequently for environmental noise impact assessment.

You can see that a truck going by at 50-feet, that is a heavy truck, is about 90 DBA. There is a washing machine at home at three feet running is about 65. In this room, when there is nobody here, it is 49-50. The LRV outside on the street when it passes by is in the high seventies.

Now I wanted to show in terms of the ventilation system noise how does that compare to the sound levels. Okay, we estimated that the

(Levy)

ventilation system without any control at 200 feet away from the building was about 84 DB. The criteria that we establish, that we aim to achieve with a margin of safety, is 65 DBA. That is only a criteria, and there is a margin of safety in there, and we aim to do better than that, and being of an engineering background, we go from the lower end up. We want to be conservative and then we will try to do better than that.

Now this 20 DB reduction may not seem a lot; in reality, it is a reduction of 100 times, meaning to limit the escape of acoustic energy emission to one-hundredth of its original emission while providing enough air to ventilate the tunnel.

Now the 65 DBA maximum at 200 feet from vent building or fan building, as established by the project design criterian,to fully comprehend the environmental noise impact which is assessed in detail in the study report, by adopting this design criteria we need to understand a little bit about how the ventilation system was designed to operate. Now during the passage of the heaviest train, the east portal fan is expected to operate for 25 minutes, and the mid-tunnel vent building fans are then expected to operate 30 minutes in various combinations. In addition to this on and off feature, the four fans

(Levy)

in the vent building, working many combination modes, 28 or more -- so I am told, depending on the train positions and weather conditions, show some of the operating conditions, a full load.

At any one time one of the many different system operating modes is in effect, however, at no time it will involve more than three fans running at or frequently below maximum loads shown in this table.

The impact assessment made and design criterians so selected are for this worse case situation with three fans running a full load. Thus, the worse case scenario maximizes the potential noise impact and provides an effective margin of safety. With this understanding, we will look at the result of preliminary assessment of the consequences in adopting this design criteria.

Shown in this table is a simple assessment of what one can expect to result from the vent building when the vent system is operating under the worse case condition around the mid-tunnel vent building. The first column, distances from the building surface -- that direction looked at four directions, and that is the ventilation noise. That is a very simple assessment method. That is just taking the design criteria 200 feet and doing the normal decay of sound, and that is the corresponding highway

(Levy)

noise at these positions. They can be regarded more or less as being ambient noise. That is the effect of the imposing when the two get together after the system goes into operation. It is a logrithmic kind of addition, so the numbers look kind of funny, and that is the difference between -- during operation versus the ambient.

It can be seen that in looking at these numbers the significant increases will be more or less limited to 800 feet within the surface of the building. Now what do we mean by "significant". Significant normally is anything greater than 5 DBA.

There is an instance on the east side where it is significant -- could be above five, but again this a very simple method without accounting for any of the extra losses they might have, and in the actual design, we will show that it is a lot less than that. And to the east, if you remember, also it is going up the slope; it is away from the highway, therefore, the ambient noises are also lower. That is why you get bigger increases.

Now using this simplified assessment, if we just take the distances to these different noise sensitive receptors, the ventilation noise at the Monument, the Park administration compound, campground and hotel, will be far below the existing background noise, and as such, no

(Levy)

noise or adverse effects are expected at these key receptor points, and this design criteria thus will result also in a day-night average noise. This is the average over a 24-hour period of 55 DBA, everywhere except within this 800-foot radius, and the LBM, the day-night level, of 55 is generally accepted as compatible with park use to protect public health and welfare and also of growth potential impact on wildlife.

Having established the design criterian, which would limit the impacted area to within 800 feet of the vent and the fan buildings, and would satisfy all other environmental impact assessment criteria outside the limited localized zone of inference, a detailed evaluation is then made using mechanical and architectural plans and site topography. In the evaluation we accounted for mountain reverberation,building orientation, and et cetera, and silence of performances were also evaluated.

I will show here what the results are. This picture represents the distance from the building surface and the sound level, and that is on the intake side of the building, the exhaust side of the building and to the sides of the building. You can see at 200 feet we will be, in fact, much more below our 65 DBA criterian, at least, we have confidence that this can be achieved.

(Levy)

Now as a comparison, this would show -- here is the design after control and that is the un-silence system, there is a substantial drop. Shown also here is a typical open vent system that is most often used in highway and rail tunnel vent systems, and as you can see most of them are very, very high -- much, much higher. The size of these fans and how they sound can only comprehend if you go facing one of these fans. If you stand 100 feet or 200 feet, it can probably blow you away, if you are my weight.

Now to achieve the design objective we are currently developing acoustical specifications of fans and silencers, which an equipment supplier will have to comply with, and furthermore, some field test procedures of acoustical performance are being developed for quality assurance purposes, and by the way, there are no on-the-book procedures for doing that, but we are making a special effort to develop these procedures for implementation.

There are other back-up design features that we have considered and we are keeping them in our pockets. We are considering perhaps additional dot lining or wad insulation if that is really necessary. At this point we are pretty confident that with the design features that we are building in, we can achieve this without going

(Levy)

to these back-up procedures. That is all. Oh yes, I only wanted to mention that all these things that I have used, they are in the report, so anybody who is interested, they can go through the report.

THE CHAIRMAN: Thank you for the presentation. I think I would like to have our own Panel technical expert come up now and make his presentation and then we will have an opportunity for any questions from the various people. If you could come up and sit up here, Mr. Kennedy.

H-1

(Kennedy)

MR. DOUG KENNEDY (Harford, Kennedy & Wakefield Limited): I am Doug Kennedy of Harford, Kennedy Limited, Consultants.

Members of the Panel, ladies and gentlemen, most of the background I think has been presented already so I will keep this fairly brief.

At last year's public meetings a number of potential noise sources were discussed including construction noise and tunnel ventilation system noise. It was concluded that while construction noise might be annoying to some park users, it will be temporary in nature and therefore tolerable. Noise from the ventilation system, however, warranted further investigation.

Over the past year, C.P. Rail has carried out a thorough study on this subject.

Two acoustical objectives have been noted by C.P. Rail's consultant: One, that the day night sound level, LDN, should not exceed 55 DBA except within 800 feet of ventilation buildings; and two, that no environmental degradation, that is increases in existing noise level, should occur except within 800 feet of the buildings.

It is my opinion that the first objective is reasonable considering the general nature of the Park, and the second objective is obviously desirable if it can be achieved.

In order to simplify engineering design

H-2

(Kennedy)

calculations and to permit a straight-forward means of inspection upon completion, the criterion of 65 DBA maximum at 200 feet has been proposed. It is reported that if this criterion is met, both of the acoustical objectives noted previously will be satisfied.

Having reviewed the acoustical design calculations, it appears to me that the proposed silencing measures will ensure a maximum noise level of 65 DBA or less at 200 feet from the ventilation buildings. Having verified this, further analyses were reviewed to ensure that given a level of 65 DBA at 200 feet, the LDN will not exceed 55 DBA and furthermore, no degradation will occur beyond 800 feet.

It was my conclusion at the first objective, that is of achieving an LDN less than 55 will be realized. However, the question of whether any degradation will occur beyond 800 feet required some clarification. It is suggested on page 25 of the consultant's report that the criterion for environmental degradation by an intruding noise is audibility, and to be inaudible, the level of the intruding noise needs to be at least 5 DBA below the previously existing background noise level. The reason for this is that the human brain can detect a sound which is quieter than the background level if it has some identifiable characteristic, such

H-2

(Kennedy)

as the tonal quality which is typical of fan noise.

The consultant then states on subsequent pages that to be significant or readily noticeable, the sound level must increase by 5 DBA. This latter statement would be true if the fan noise had no tonal quality. However, since there will likely be a tonal quality, the earlier statement that the intruding noise will be audible at 5 DBA below the background noise is correct and should be used as a criterion for environmental degradation.

On this basis, fan noise may be audible at distances in the order of 2,000 feet rather than 800 feet in some directions if the maximum allowable level of 65 DBA at 200 feet actually occurs. This does not necessarily present a problem, however, since the whole analysis is based on a worse case situation which will only occur over limited periods of time.

Furthermore, the proposed fan silencers will likely result in levels below 65 DBA at 200 feet except perhaps at the east portal where there does not appear to be any safety margin.

It should be noted that due to the relatively high levels of noise along the highway, noise from the ventilation system will on most occasions be inaudible at the Summit Monument and at the nearly hotel. It may provide some reassurance

H-3

(Kennedy)

to all concerned that during a recent visit to the site I carried out the following brief experiment. An airhorn was sounded at the site of the mid-tunnel ventilation building. A resultant sound was measured both at 200 feet from the horn and also at the Summit Monument. The measured sound attenuation between 200 feet and the Summit Monument was in close agreement with the predicted value of attenuation.

In conclusion, it is my opinion that C.P. Rail and its consultant have done a comprehensive job in analyzing the potential effects of noise from the tunnel ventilation system.

I would recommend that the basic acoustical criterion from this point on should be to achieve 65 DBA or less if possible at 200 feet from the ventilation buildings. Given C.P.'s assurance that the ventilation system will be constructed to achieve this, then the resultant noise should be compatible with the Park environment.

THE CHAIRMAN: Thank you for your presentation. Perhaps if we could have C.P.'s expert, if you are finished?

MR. KENNEDY: Yes.

THE CHAIRMAN: C.P.'s expert up at the front here and then maybe we could provide an opportunity ---

The question I have relates to something

H-3

that came up in one of the earlier meetings and that was the question of whether anything further could be done. In the event that worse comes to worse and this 65 DBA level was not achieved, I thought I heard the suggestion at one of the other meetings that there could be some lining of some of the shafts or vents. Could you perhaps explain to me how much extra silencing that could give you and is that something you can retrofit in or do you have to build it right into the building?

MR. VAN LEE: It can be retrofitted in and the problem with the lining of the material achieves some high frequency attenuation in addition. However, the material -- we are looking at some materials that are anti-corrosive, can be washed, can stand the wind load in it. We have located one such perspective material and we are looking at it. We have some installation diagram on that, so if worse comes to worse, we can definitely bank on that.

However, we are trying to really tighten up the engineering specifications, contract specifications and we are instituting in our contract specifications rigorous testing methods once the fan -- the fan actually has to go in the start-up testing anyways for mechanical performance. So we would be doing acoustical performance at the same time with both the fan and the silencer.

THE CHAIRMAN: Bill Ross, you have a

H-4

question.

DR. ROSS: I was perhaps going to pursue that. Mr. Kennedy, I wonder first if you could provide us with your assessment of whether the silencing measures which are proposed are state-of-the-art, that is, you can sort of buy them off the shelf or are they at the frontiers and therefore pushing everything that acoustical engineers can do? How certain are we that the mitigation measures currently proposed will work?

MR. KENNEDY: It is hard for me to comment on that, having not, you know, checked into the suppliers' products in detail, but it was my general reaction on reading the description that the silencers proposed were sort of on the upper end of what is available. In other words, they were high performance models, but on the other hand I do not think we are really sort of breaking new ground here. They are certainly not experimental devices or anything.

DR. ROSS: Do you have any comment on that?

MR. LEE: I would say that is pretty much true. The silencers we are getting, they are available. They are not really specially made. However, we are looking at five different suppliers, two of them have special types which have only recently, in recent years, been tested, and we are looking at these and we will be putting out contract

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specifications and inducement to have these specialized so-called resident type silencers, which does a little bit better in cutting down the tunnel.

DR. ROSS: Have they been field tested at all?

MR. LEE: Yes. Some of them have been installed in very large industrial applications and they have been tested.

DR. ROSS: To your specifications?

MR. LEE: To very similar specifications.

DR. ROSS: Thank you.

THE CHAIRMAN: George Tench, do you have any questions?

MR. TENCH: No.

THE CHAIRMAN: Does anybody have any further questions concerning the presentations on this particular topic? If that is the case, I would like to thank both of you for making the presentations on this topic and move into the subject that we were scheduled to discuss this afternoon which is closing statements.

MR. FOX: One more, air quality if you want to hear it. If you do not, that is great.

THE CHAIRMAN: I did not realize that was on the schedule.

MR. FOX: Yes. You are going to get the whole works whether you like it or not, Mr. Chairman.

THE CHAIRMAN: You keep slipping these

H-6

extra ones in that I do not know about.

MR. FOX: I am sorry. I thought that you were aware of that. That is the last one. guaranteed.

H-7

(Jandali)

DR. TAREK JANDALI (Environmental Services Ltd.): I can reassure the Panel I just have a brief statement. two pages. However, the statement itself will summarize the results of the report, so I will not delve into that.

But in Parks' submission there were some comments made with regard to air monitoring, and I thought perhaps I could offer some suggestions to the Panel as to how they could resolve that issue.

Further to submissions made to the Rogers Pass Environmental Assessment Panel during April 1982, changes to the location and specification of the ventilation system dictated a review of potential effects of air emissions. Therefore, an assessment was conducted on behalf of C.P. Rail, and a report titled "Assessment of Impact of Air Emissions from Ventilation of Rogers Pass Tunnel" was prepared and submitted to the Panel. The purpose of this brief is to present a summary of methodology used in the assessment and conclusions reached.

Dispersion calculations were performed to estimate maximum ground level concentrations of oxides of nitrogen, as NO_2, since they are the largest single pollutant emitted from the tunnel. Two distinct dispersion models were used: One, the model STACKS developed by the Alberta Environment was applied to predict maximum ground level concentration

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(Jandali)

associated with wind; and two, a simple box model developed by ESL was used to estimate concentrations during prolonged periods of calm. These models were applied separately for a six and a five unit train with a 15,000 ton trailing load. Furthermore, calculations were performed for summer and winter conditions, as well as for south and north wind to account for differences in surrounding topography.

For meteorological conditions associated with wind, results indicate that maximum hourly ground level concentrations were estimated to be .18 ppm and .15 ppm NO_x for the six and five unit model trains respectively. These predicted maximum ground level concentrations under worse case meteorological conditions and during maximum frequency of trains are less than the Federal Government maximum acceptable guidelines of .21 ppm of NO_2 for one hour. Furthermore, and this is important, the location of points of maximum impingement are far removed from any human activities within Rogers Pass.

Analysis of the frequency of occurrence and duration of calm conditions indicated that periods of up to nine hours can occur. These conditions can give rise to potential pollutant accumulation in the relatively narrow Rogers Pass Valley. Model results indicate that maximum hourly average ground level concentrations in areas

II-9

(Jandali)

associated with human activities are estimated at worse case to be .18 ppm and .13 ppm during summer and winter conditions respectively. These levels are also well below the Federal Government guidelines of .21 ppm of NO_2 for one hour.

These predictions are based, i.e. the calm wind predictions, are based on the assumption that the pollutants are uniformly mixed in the valley air space. Often during calm, stable atmospheric conditions will prevail and it is recognized that mixing will be limited. Therefore, these conditions will result in larger concentrations in a thin layer of air aloft, i.e. above the exhaust exit. Ground level concentrations in areas associated with human activities within Rogers Pass will therefore be considerably less.

Finally, in view of the manner with which the emissions are discharged into the atmosphere, plume trajectories in the vicinity of the exhaust points were calculated in order to evaluate the likelihood of pollutant impingement on trees uphill from the ventilation building. The findings indicate that the plume will pass over the tree tops and that it is unlikely any serious damage to foliage could result from exhaust emissions.

This, Mr. Chairman, concludes my summary of the report, and I thought perhaps if the time was appropriate I would just like to raise a

H-10

(Jandali)

few points concerning the monitoring issue that was raised by Parks Canada.

In general we agree with the principle of background monitoring and then monitoring post-operation to determine the impact of a resulting operation. However, I would like to start off with some general comments and get back to the specific points of C.P. Rail. We personally are involved in such a program for Northeast Coal in Prince Rupert where coal is not flowing and yet a program is fully underway.

If NO_x emissions from the shaft are to be ultimately monitored, their location should be at points of maximum impingement because we are not talking about very large concentrations. That would put the location of monitoring points approximately at an elevation of 4700 feet and approximately a quarter mile north and south of the vent building locations.

These points of monitoring require power, require access and maintenance and the locations are very close to the edge of the avalanche path. Furthermore, if the reason for monitoring NO_x is to implement remedial measures should the problem deteriorate, the exercise is futile because nothing can be done to eliminate emission of NO_x from tunnel ventilation.

Location of a monitoring trailer at

H-11

(Jandali)

Parks Canada compound will record mostly vagueal emissions and it will detect very little contributions from the vent shaft.

We recognize that modelling techniques are approximate at best, but we believe that the confidence limit in those techniques is sufficient to permit us to make a statement in the sense seeing that the contribution at the Parks compound will be very, very minimal indeed, and putting a trailer down there or a monitoring situation down there will not necessarily monitor effects of the stacks.

Now I would like to make a couple of more specific comments concerning the Rogers Pass and perhaps place these emissions in perspective. In our predictions we have always assumed worse case scenarios and assumed very conservative assumptions. In particular, all of the nitric oxides emitted which are composed approximately 75 percent NO and 25 percent NO_2 have been converted to an equivalent NO_2 in their entirety. This is conservative largely because, and it had to be done for the following reasons in that no guidelines exist for NO, and secondly, it is conservative because the toxicity of NO is about five times less than that of NO_2.

Finally to put the emissions further in perspective for perhaps the people who are not so well versed with dispersion in that the emissions

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(Jandali)

that we are dealing with here that are coming out of the tunnel, we are dealing roughly with one train every hour, a total of 24 trains per day, not all of them are these maximum unit trains. The vent shaft basically ventilates one-half of the tunnel and that is the west half of the tunnel.

Most of the volume of air emitted from the vent shaft is basically air drawn in from the west portal, so there is a terminus amount of dilution that takes place before the air is emitted from the shaft itself.

As a result, for comparison, a train travelling in the west portion of the tunnel, i.e. approximately four miles, give or take some distance, and diluted and emitted at a high point in the Valley will result, in my opinion, in less concentration within the Valley than would have been the case if the train was allowed to travel a surface route.

In view of all of these points above, it is very difficult for me on a technical basis to justify a monitoring program.

Thank you.

THE CHAIRMAN: Thank you for your presentation. Panel, do we have any questions? Perhaps Parks might like to at this time if they wish to make any further response. They raised the question of monitoring originally. Are you now

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satisfied following this presentation or do you wish to reserve your position and get back to us after you have consulted your expert?

DR. LEESON: I think that since Dr. Jandali and Mr. Faulkner live in the same city, it might be good for them to talk, perhaps even over the telephone and for the two of them to decide what is best. It does not look very prospective from this end.

THE CHAIRMAN: Do you think you could raise that, then, with the AES person, since he is not party to all the discussions that have gone on here, and suggest that perhaps he might like to chat with the expert from C.P. Rail and you know, one or other can phone.

DR. LEESON: Would that be acceptable to C.P. Rail and to Dr. Jandali? That certainly would be all right for us.

DR. JANDALI: Mr. Chairman, I know Don Faulkner very well and he and I had touched on the subject before coming to the hearings. We have not resolved anything pending the outcome of the hearings.

THE CHAIRMAN: Perhaps if you do resolve it you can let us know what you have or if there is an outstanding difference, let us know, in any case.

DR. LEESON: That will be fine with us.

THE CHAIRMAN: Any questions? Bill Ross.

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DR. ROSS: Just briefly. The report you gave tracked the plume center line and observed that it was well away from the trees. What are the concentrations off the center line? Do they have any concern for the trees because if the trees do not continue growing then the visual impact may deteriorate as well if there were any impact on the trees.

DR. JANDALI: Good question, Dr. Ross. Actually we looked at the vertical and horizontal co-efficient that is associated with the center line plume and for a distance of that short there is very little dispersion that takes place until the momentum jet is initially dissipated, and by then the plume is about 100 metres above the trees.

DR. ROSS: Thank you.

THE CHAIRMAN: Any questions from members of the audience? That being the case, I would like to thank you for your presentation and I know -- I am going to get to the closing comments from the various parties in a moment unless Mr. Fox has any more consultants.

MR. FOX: I have run out.

THE CHAIRMAN: I know Bill Ross has a question that he wants to put to Parks Canada. I think what we will do before going to closing statements, and I believe Parks Canada will make a closing statement and C.P. Rail, that we will allow a last brief opportunity for any questions to be

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put forward, and I will start with Bill Ross.

DR. ROSS: The only one I wanted to do was to reiterate or I guess open the opportunity for Mr. McKnight or Mr. Gallacher to make any suggestions on improving the specs or whatever for the Environmental Coordinator or the Environmental Committee. I mentioned to you in Golden that I was going to come back and ask you that, so if you have any suggestions that you would make, I would be happy to hear them now or perhaps they may be part of your final statement in which case we will get to them at that time.

MR. GALLACHER: They are not part of our final statement, but I would like to meet with the Environmental Committee first and discuss it thoroughly with them before we make any decisions if you are in agreement with that?

DR. ROSS: Will that happen before the end of the month?

MR. GALLACHER: Yes.

DR. ROSS: You can get us any response, then, from the Committee before the end of the month?

MR. GALLACHER: By the end of the month I will.

DR. ROSS: Thank you very much.

MR. McKNIGHT: The issues that were raised in Golden we have had some thoughts about. I sincerely hope that C.P. does not hire too many more consultants because every time they give me

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about eight more jobs I have to do. So I hope that is getting close to the end of it.

The issue of resolving disputes is really no clearer in my mind than it was before. It is something you gentlemen can maybe consider. In the past the whole issue of whether you are trying to merely correct a problem or whether there is an actual punitive -- do you go beyond correcting the problem merely to try to ensure that it does not happen again. Those sort of areas, and in addition the amount of manpower and time, the level of inspection that should be anticipated for a job this size. Unfortunately we did not get into detailed discussions on that.

I think that there is potential for using the C.P. inspectors to monitor a lot of the environmental conditions because they are included in the contracts. I have talked to other people about that who feel that it is a little bit of a naive thing for me to suggest in that you do not get the fox to guard the chicken house. That was not very good, was it.

MR. FOX: Just keep on.

MR. McKNIGHT: I do not know if those things are referred to as Freudian slips or what.

But I feel relatively confident that we can, you know, resolve this at the Environmental Committee level and I think some excellent points were raised about the composition of the committee

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and I think there probably is room for improvement. There is room for probably more technical expertise. I appreciated Mr. Fox's comment in Golden about other people. At times I feel that I am out there by myself and that I have to be the initiator of all endeavours towards environmental protection. There does not seem to be in a lot of cases other people out there coming up with initiatives.

I guess that is the end of my statement, thank you.

THE CHAIRMAN: Any further questions from anybody at this time? Mr. Fox, do you have any final questions? You will have an opportunity to make a final statement at the end.

MR. FOX: No, I have no further questions. Thank you, Mr. Chairman.

THE CHAIRMAN: That being the case, I guess I will call on Parks Canada to make their statement and then go to Mr. Fox and then I will make some short concluding remarks of my own. So if you would like to either use the microphone or come up and make any concluding statements you wish to.

H-18

(Leeson)

DR. BRUCE LEESON: Mr. Chairman, I feel that Canadian Pacific Rail has responded to the earlier directions of the Panel with respect to conducting further research, and I also feel and can advise you that C.P. Rail has responded to Parks Canada's request in the interim in many of our meetings for the conduct of further research and provision of additional information.

We conclude that C.P. Rail's consultants have done good work and although the proceedings over the last couple of days have revealed that there are a number of loose ends which must be attended to, we think that they can be within the context of the Panel's deliberations as you carry out your responsibilities, and also in further technical workshops between Parks Canada and C.P. Rail and possibly with input and assistance of the Panel's technical experts. We would be able to focus on unresolved issues where we would be forced to achieve a compromise and to establish agreed goals.

So with that prelude, I again would reiterate what I said Wednesday night, that we think the Panel can approve the project but that approval, however, should be conditional upon Mr. Fox's very exquisite verbal and red book written commitment that they will employ a state-of-the-art technology in protecting the environment of Glacier Park and

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(Leeson)

reclaiming those Parks that are subject to unavoidable impact.

I would like to leave you with four points for your consideration. Our number one priority in the whole project is that reclamation is the major concern. The second point of priority is that we do not want the work camps or the parking areas in the Park. The third point is that we would like to participate in consideration of further options which could be utilized to minimize terrain impact where that would be significantly helpful in reclamation objectives. For example, could retaining walls be used for the purpose of flattening the slope if it is considered that the slope is in a steep and difficult place that would compromise reclamation. The fourth one is directly for the Panel's consideration, and that is that we request assistance in some way, either directly from you or recommendations from you for our Miniter in order to be able to conduct technical reviews of the specific designs and plans that are put forward by C.P. Rail and their consultants in the months to come in order that we can do an intelligent and thoughtful job of analyzing what is being proposed and to be able to ensure the concerned public that our agency is managing this project in Glacier National Park as responsibly as possible. Thank you.

THE CHAIRMAN: Thank you very much

H-20

(Fox)

for your comments, Dr. Leeson. Thank you very much for your participation and the participation of your colleagues, Mr. Gallacher and Mr. McKnight during these hearings. It has been very useful to us.

I would now like to pass to Mr. Fox for his concluding remarks.

MR. JOHN FOX: Thank you, Mr. Chairman. I only have about three points but I would like to discuss them. There has been during this session a lot of discussion concerning the width of right-of-way which the railway is requesting. Parks Canada has expressed their concern in this regard. Railway rights-of-ways vary in width in Canada from 66 feet in width, generally found in parks in some of our eastern provinces to 200 feet in width across most of our prairie provinces.

In areas where steep side slopes exist, the width of rights-of-ways is always such that the full extent of cuts and fills are within the right-of-way boundaries. The total width does vary to suit the conditions which exist. The actual area required on the Rogers Pass project surface route for clearing and construction amounts to 158 acres. The remaining acreage is required to straighten out the property lines to provide a basis for a proper legal land description. It would be next to impossible to provide a legal description of land if only the slope stake limits were followed.

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(Fox)

In this case, the required width is dictated by the size of the cuts and fills necessary to construct the new railway line. The existing railway line, which is the one Mr. Tench and I discussed here some time ago, which is located in a more favourable location, being on a bench, has a similar varying width of right-of-way which can be seen on the exhibits presented to this hearing.

As has been explained a number of times, the main thrust of Parks Canada and the intervenors and even your own witnesses have indicated that the visual impact is one of the most important considerations to be taken into account in the design of this railway line.

In all aspects of our design, the visual impact has been our major consideration. Indeed, my own staff at times consider me to be paranoid in insisting that in all of our design considerations this must be of paramount importance. The alignment design, which has been presented, has met all of Parks Canada's concerns and suggestions to minimize the visual impact. During our one week workshop with Parks Canada they, at that time, were most pleased with how we had handled this problem. If one is to screen the proposed railway to the maximum extent, you have to, in terrain such as we are building upon, keep the upper slope cuts to a minimum and make use of the tree screen on the

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(Fox)

lower slope. Unfortunately, the steepness of the side slopes in the area between Rogers and the east portal of the short tunnel are such that long downhill side slopes are unavoidable.

We have used retaining walls very extensively in our design, the cost of which estimate-wise now exceeds some $15 million alone.

The use of retaining walls in the downhill slopes will not improve in any manner the visual impact as the large majority of the downslope fills are not seen due to adjacent tall trees. The total acres required of some 317 over some ten miles of route in terrain such as exists in the area under discussion is not at all out of proportion.

The alignment presented has been carefully thought out and engineered to the highest standards possible.

I cannot think of any reason why additional money has to be spent on large and very expensive retaining walls such as would be required to save some 10 to 15 acres of land. The relative cost of this land based on the cost of retaining walls would amount to something like $1.4 million per acre.

In addition to being responsible for all environmental consideration, one also must keep in mind what this line of railway is required for, and that is carriage of this nation's goods

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(Fox)

to the marketplace. This, then, places a responsibility on C.P. Rail and I might also add the Panel, to ensure the total cost of the work is reasonable and that in the final equation Canadians do not have to pay more than they should for transportation services.

Camps for the construction workers. Again, much has been said concerning work camps in Glacier National Park. C.P. Rail has made a concerted effort to develop a camp standard which will minimize damage to the Park. We have employed top notch people to design the camps, the layout, the structures and facilities so they will be attractive, neat and will not detract from the areas we propose to locate them in. Indeed, some of the existing permanent structures in the Park are not as attractive.

Proposed sites, that is, Beaver Pit Camp and Glacier Camp will be in locations of former camps. Very little clearing is required. Both sites cannot be seen from the highway or viewpoints. C.P. Rail has indicated that all environmental requirements will be met.

The question of bear protection fences has been thoroughly looked into. It is indeed very difficult to understand why temporary camps such as proposed require fencing when all other inhabited areas within the Park in the same animal environment

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(Fox)

do not require such fences. An experienced camp operator who has operated such camps throughout B.C. and northern Alberta has spoken in this regard.

The people who would object or consider the need for such fences have had little or no experience in the operation of any such establishment. Indeed, Parks Canada people themselves have indicated little or no problems with bears around the establishments in the Park, including Glacier Park Lodge Hotel.

To locate these camps outside the Park boundaries will add $33 to $38 million to the cost of the project for no acceptable reason and delay the completion of the project beyond 1988, which is the year projected to be the time when C.P. Rail will reach its capacity limit on moving trains over this territory. Parks Canada has stated that their policy is to allow no such establishments within the Park. I can see this policy in relationship to permanent establishments but suggest that such a policy does not exist for those of a temporary nature. If such a policy exists, then how could we have had both the Beaver site and the Flat Creek site approved last year prior to the 1982 Panel hearings.

Mr. Chairman and members of the Panel, the location of these work camps is of paramount importance to the successful completion of this important project. The area concerned is in one

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(Fox)

of the heaviest snow areas in Canada and we must have camp locations as close to the work site as is possible so that during the winter months delays due to snow and avalanche problems have minimum impact on loss of work time.

In addition, I might state this. We have indicated that C.P. Rail will be operating these camps. If that is the case, and it will be the case, then our police force comes into the picture and we can then use our own forces to police these camps.

Visual impact and terrain impact are words that must be looked at very carefully and used in their proper context. I am sure you and your Panel members will be careful in this regard.

C.P. Rail has committed itself to minimize both the visual and terrain impact. All other environmental requirements will, and you have my assurance, be carefully controlled, monitored and be looked after to the highest standards.

As mentioned in Golden, it is my intention to have on site during the actual construction an experienced, professional environmentalist to ensure that these important aspects of the construction project are fully and adequately protected.

Mr. Chairman, I would like to thank you, your Panel members and your experts for the

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(Fox)

effort you have all carried out. I would, however, like to express to you the importance of releasing your final report on this project as quickly as possible. We in C.P. Rail still have a lot of work to do and your input will be of paramount importance to ensure the successful completion of all aspects of this project.

I would also like to thank my own staff and all of C.P. Rail's consultants for the excellent effort they have all put forth to enable you and your Panel members to better appreciate what we are to build and how it will be done. Thank you very much.

THE CHAIRMAN: Thank you for your concluding remarks, Mr. Fox.

I earlier thanked Parks Canada for their input during this process. I would now like to take this opportunity to thank C.P. for the considerable amount of information that they have brought forward, and aside from some of my joking comments about the number of consultants that you had, that was extremely valuable information and I would like to compliment the consultants on their input during this process. I would also like to thank our own technical experts for coming along.

I would finally like to thank the Court Reporters who have been faithfully reporting all of this information which we are now going to have the job of going away and trying to digest and as

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speedily as possible and putting together in the form of a report to the Minister of the Environment.

The Minister of the Environment, of course, is responsible for release of the report if he wishes, and all previous reports have been made public and made available to all interested parties.

The Panel's mandate and task will be to recommend the best way for this project to proceed with minimal impact on the environment. That was the job that we were given to do and this is our final report that we were asked to write by the Minister.

I think with that point I would just close off the sessions here and hope to see you all again some time. Thank you very much for coming along.

---Whereupon the hearing adjourned at 2:15 p.m.